

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
DC voltage sources: single values	Voltage standard	Difference measurement	1	1	V			180	nV/V	2	95 %	Yes			1
DC voltage sources: single values	Voltage standard	Difference measurement	1.018	1.018	V			180	nV/V	2	95 %	Yes			2
DC voltage sources: single values	Voltage standard	Difference measurement	10	10	V			65	nV/V	2	95 %	Yes			3
DC voltage sources: low values	Josephson voltage standard	Direct comparison	0	10	V			1	nV	2	95 %	No			4
DC voltage sources: low values	DC voltage source, source noise N	Compensation	0	10	V			$Q[25, N]$, N in nV	nV	2	95 %	No		Uncertainty depending on DUT	5
DC voltage sources: intermediate values	DC voltage source	Resistive divider	10	1000	V			500	nV/V	2	95 %	Yes			6
DC voltage meters: very low values	DC voltmeter, meter resolution R	Direct comparison	0	1	mV			$Q[10, R]$, R in nV	nV	2	95 %	No		Uncertainty depending on DUT	7
DC voltage meters: intermediate values	DC voltmeter, meter resolution R	Direct comparison	0.001	10	V			$Q[10, R]$, R in nV	nV	2	95 %	No		Uncertainty depending on DUT	8
DC voltage meters: intermediate values	DC voltmeter	Resistive divider	10	1000	V			500	nV/V	2	95 %	Yes			9
DC voltage ratios: up to 1100 V	Resistive dividers	Comparison with reference divider	0.1	0.1		Input voltage	100 V	0.50E-06		2	95 %	Yes			9a
DC voltage ratios: up to 1100 V	Resistive dividers	Comparison with reference divider	0.01	0.01		Input voltage	1000 V	0.60E-06		2	95 %	Yes			9b
DC resistance standards and sources: low values	Fixed resistor	DCC bridge	1E-04	1E-04	Ω	Power	1 W	4.6	$\mu\Omega/\Omega$	2	95 %	Yes	In oil, temperature and power coefficients on request		10

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

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DC resistance standards and sources: low values	Fixed resistor	DCC bridge	1E-03	1E-01	Ω	Power	400 mW to 25 mW	2.3 to 1.2	μΩ/Ω	2	95 %	Yes		In oil, temperature and power coefficients on request	11
						Temperature	15 °C to 30 °C								
DC resistance standards and sources: low values	Fixed resistor	DCC bridge	1	1	Ω	Temperature	15 °C to 30 °C	240	nΩ/Ω	2	95 %	Yes		In air or in oil, temperature coefficient included <i>This CMC is related to the next one</i>	11a
DC resistance standards and sources: intermediate values	Fixed resistor	DCC bridge	1	100	Ω	Temperature	15 °C to 30 °C	240	nΩ/Ω	2	95 %	Yes		In air or in oil, temperature coefficient included <i>This CMC is related to the previous one</i>	20
DC resistance standards and sources: low values	Fixed resistor	CCC	1	1	Ω	Temperature	15 °C to 30 °C	4.7	nΩ/Ω	2	95 %	Yes		In air or in oil, temperature coefficient included, pressure coefficient on request	12
DC resistance standards and sources: intermediate values	Fixed resistor	CCC	10	10	Ω	Temperature	15 °C to 30 °C	5.5	nΩ/Ω	2	95 %	Yes		In air or in oil, temperature coefficient included, pressure coefficient on request	13
DC resistance standards and sources: intermediate values	Fixed resistor	CCC	25	25	Ω	Temperature	15 °C to 30 °C	5.5	nΩ/Ω	2	95 %	Yes		In air or in oil, temperature coefficient included, pressure coefficient on request	14
DC resistance standards and sources: intermediate values	Fixed resistor	CCC	1E+02	1E+02	Ω	Temperature	15 °C to 30 °C	4.4	nΩ/Ω	2	95 %	Yes		In air or in oil, temperature coefficient included, pressure coefficient on request	15
DC resistance standards and sources: intermediate values	Fixed resistor	CCC	1E+03	1E+03	Ω	Temperature	15 °C to 30 °C	4.4	nΩ/Ω	2	95 %	Yes		In air or in oil, temperature coefficient included, pressure coefficient on request	16
DC resistance standards and sources: intermediate values	Fixed resistor	CCC	1E+04	1E+04	Ω	Temperature	15 °C to 30 °C	4.1	nΩ/Ω	2	95 %	Yes		In air or in oil, temperature coefficient included, pressure coefficient on request	17

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

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DC resistance standards and sources: intermediate values	Fixed resistor	CCC	1E+05	1E+05	Ω	Temperature	15 °C to 30 °C	15	nΩ/Ω	2	95 %	Yes		In air or in oil, temperature coefficient included, pressure coefficient on request	18
DC resistance standards and sources: intermediate values	Fixed resistor	CCC	1E+06	1E+06	Ω	Temperature	15 °C to 30 °C	110	nΩ/Ω	2	95 %	Yes		In air or in oil, temperature coefficient included, pressure coefficient on request	19
DC resistance standards and sources: intermediate values	Fixed resistor	Potentiometer	1E+03	1E+03	Ω	Temperature	15 °C to 30 °C	140	nΩ/Ω	2	95 %	Yes		In air or in oil, temperature coefficient included	21
DC resistance standards and sources: intermediate values	Fixed resistor	Potentiometer	1E+04	1E+04	Ω	Temperature	15 °C to 30 °C	85	nΩ/Ω	2	95 %	Yes		In air or in oil, temperature coefficient included	22
DC resistance standards and sources: intermediate values	Fixed resistor	Potentiometer	1E+05	1E+05	Ω	Temperature	15 °C to 30 °C	200	nΩ/Ω	2	95 %	Yes		In air or in oil, temperature coefficient included	23
DC resistance standards and sources: intermediate values	Fixed resistor	Potentiometric ratio bridge	1E+06	1E+06	Ω	Voltage	1 V to 10 V	1	μΩ/Ω	2	95 %	Yes		In air, temperature coefficient included	24
						Temperature	15 °C to 30 °C								
DC resistance standards and sources: high values	Fixed resistor	Potentiometric ratio bridge	1E+07	1E+07	Ω	Voltage	1 V to 10 V	3	μΩ/Ω	2	95 %	Yes		In air, temperature coefficient included	25
						Temperature	15 °C to 30 °C								
DC resistance standards and sources: high values	Fixed resistor	Potentiometric ratio bridge	1E+08	1E+08	Ω	Voltage	1 V to 10 V	4	μΩ/Ω	2	95 %	Yes		In air, temperature coefficient included	26
						Temperature	15 °C to 30 °C								

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

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DC resistance standards and sources: high values	Fixed resistor	Potentiometric ratio bridge	1E+09	1E+09	Ω	Voltage	1 V to 10 V	10	µΩ/Ω	2	95 %	Yes		In air, temperature coefficient included <i>This CMC is related to the next one</i>	27
						Temperature	15 °C to 30 °C								
DC resistance standards and sources: high values	Fixed resistor	Modified Wheatstone bridge	1E+09	1E+09	Ω	Voltage	10 V	12	µΩ/Ω	2	95 %	Yes		In air, temperature coefficient included, voltage coefficient on request <i>This CMC is related to the next one</i>	28
						Temperature	15 °C to 30 °C								
DC resistance standards and sources: high values	Fixed resistor	Modified Wheatstone bridge	1E+09	1E+09	Ω	Voltage	100 V to 1000 V	7	µΩ/Ω	2	95 %	Yes		In air, temperature coefficient included, voltage coefficient on request <i>This CMC is related to the previous ones</i>	34
						Temperature	15 °C to 30 °C								
DC resistance standards and sources: high values	Fixed resistor	Modified Wheatstone bridge	1E+10	1E+10	Ω	Voltage	10 V	130	µΩ/Ω	2	95 %	Yes		In air, temperature coefficient included, voltage coefficient on request <i>This CMC is related to the next one</i>	29
						Temperature	15 °C to 30 °C								
DC resistance standards and sources: high values	Fixed resistor	Modified Wheatstone bridge	1E+10	1E+10	Ω	Voltage	100 V to 1000 V	45	µΩ/Ω	2	95 %	Yes		In air, temperature coefficient included, voltage coefficient on request <i>This CMC is related to the previous one</i>	35
						Temperature	15 °C to 30 °C								
DC resistance standards and sources: high values	Fixed resistor	Modified Wheatstone bridge	1E+11	1E+11	Ω	Voltage	10 V	160	µΩ/Ω	2	95 %	Yes		In air, temperature coefficient included, voltage coefficient on request <i>This CMC is related to the next one</i>	30
						Temperature	15 °C to 30 °C								
DC resistance standards and sources: high values	Fixed resistor	Modified Wheatstone bridge	1E+11	1E+11	Ω	Voltage	100 V to 1000 V	120	µΩ/Ω	2	95 %	Yes		In air, temperature coefficient included, voltage coefficient on request <i>This CMC is related to the previous one</i>	36
						Temperature	15 °C to 30 °C								

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

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DC resistance standards and sources: high values	Fixed resistor	Modified Wheatstone bridge	1E+12	1E+12	Ω	Voltage	10 V	1.3	mΩ/Ω	2	95 %	Yes		In air, temperature coefficient included, voltage coefficient on request <i>This CMC is related to the next one</i>	31
						Temperature	15 °C to 30 °C								
DC resistance standards and sources: high values	Fixed resistor	Modified Wheatstone bridge	1E+12	1E+12	Ω	Voltage	100 V to 1000 V	500	μΩ/Ω	2	95 %	Yes		In air, temperature coefficient included, voltage coefficient on request <i>This CMC is related to the previous one</i>	37
						Temperature	15 °C to 30 °C								
DC resistance standards and sources: high values	Fixed resistor	Modified Wheatstone bridge	1E+13	1E+13	Ω	Voltage	10 V	1.7	mΩ/Ω	2	95 %	Yes		In air, temperature coefficient included, voltage coefficient on request <i>This CMC is related to the next one</i>	32
						Temperature	15 °C to 30 °C								
DC resistance standards and sources: high values	Fixed resistor	Modified Wheatstone bridge	1E+13	1E+13	Ω	Voltage	100 V to 1000 V	1.3	mΩ/Ω	2	95 %	Yes		In air, temperature coefficient included, voltage coefficient on request <i>This CMC is related to the previous one</i>	38
						Temperature	15 °C to 30 °C								
DC resistance standards and sources: high values	Fixed resistor	Modified Wheatstone bridge	1E+14	1E+14	Ω	Voltage	10 V	5	mΩ/Ω	2	95 %	Yes		In air, temperature coefficient included, voltage coefficient on request <i>This CMC is related to the next one</i>	33
						Temperature	15 °C to 30 °C								
DC resistance standards and sources: high values	Fixed resistor	Modified Wheatstone bridge	1E+14	1E+14	Ω	Voltage	100 V to 1000 V	1.7	mΩ/Ω	2	95 %	Yes		In air, temperature coefficient included, voltage coefficient on request <i>This CMC is related to the previous one</i>	39
						Temperature	15 °C to 30 °C								
DC resistance standards and sources: standards for high current	DC shunt	Voltage and current	1E-04	1E-01	Ω	Voltage	40 mV to 100 mV	15 to 7	μΩ/Ω	2	95 %	Yes		Uncertainty depending on DUT	40
						Current	400 A to 1 A								

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

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DC current sources: low values	Current generator	Voltage drop across shunt	1E-05	1E-04	A			3	µA/A	2	95 %	Yes			41a
DC current sources: intermediate values	Current generator	Voltage drop across shunt	1E-04	1E-03	A			3	µA/A	2	95 %	Yes			41b
DC current sources: intermediate values	Current generator	Voltage drop across shunt	1E-03	1E-01	A			3 to 9	µA/A	2	95 %	Yes			42
DC current sources: intermediate values	Current generator	Voltage drop across shunt	1E-01	1E+01	A			9	µA/A	2	95 %	Yes			43
DC current meters: low values	Nanoammeter	Charging of a capacitor	1E-16	1E-16	A			20	mA/A	2	95 %	Yes			43a
DC current meters: low values	Nanoammeter	Charging of a capacitor	1E-15	1E-15	A			2	mA/A	2	95 %	Yes			43b
DC current meters: low values	Nanoammeter	Charging of a capacitor	1E-14	1E-14	A			500	µA/A	2	95 %	Yes			43c
DC current meters: low values	Nanoammeter	Charging of a capacitor	1E-13	1E-13	A			400	µA/A	2	95 %	Yes			43d
DC current meters: low values	Nanoammeter	Charging of a capacitor	1E-12	1E-12	A			100	µA/A	2	95 %	Yes			43e
DC current meters: low values	Nanoammeter	Charging of a capacitor	1E-11	1E-11	A			90	µA/A	2	95 %	Yes			43f
DC current meters: low values	Multimeter	Voltage drop across shunt	1E-05	1E-04	A			3	µA/A	2	95 %	Yes			44a
DC current meters: intermediate values	Multimeter	Voltage drop across shunt	1E-04	1E-03	A			3	µA/A	2	95 %	Yes			44b
DC current meters: intermediate values	Multimeter	Voltage drop across shunt	1E-03	1E-01	A			3 to 9	µA/A	2	95 %	Yes			45

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

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DC current meters: intermediate values	Multimeter	Voltage drop across shunt	1E-01	1E+01	A			9	µA/A	2	95 %	Yes			46
AC resistance: real component	Fixed resistor or decade resistance box	Comparison with AC reference resistor	0.1	1E+05	Ω	Frequency	400 Hz	10	µΩ/Ω	2	95%	Yes		This CMC is related to the next one	47
						Maximum voltage	10 V								
						Maximum current	0.5 A								
AC resistance: time constant	Fixed resistor or decade resistance box	Comparison with AC reference resistor	0	1	µs	Resistance	0.1 Ω to 100 kΩ	0.001	µs	2	95%	No		This CMC is related to the previous one	48
						Frequency	400 Hz								
						Maximum voltage	10 V								
						Maximum current	0.5 A								
Capacitance: capacitance for low loss capacitors	Standard capacitor, fused silica, two terminal-pair	Capacitance standard, ratio bridge	10	10	pF	Frequency	1000 Hz, 1233 Hz, 1592 Hz	0.05	µF/F	2	95%	Yes			49
Capacitance: low loss capacitors	Standard capacitor, fused silica, two terminal-pair	Capacitance standard, ratio bridge	1	1000	pF	Frequency	1000 Hz, 1233 Hz, 1592 Hz	0.12 to 0.17	µF/F	2	95%	Yes	Matrix 4.1		50
Capacitance: low loss capacitors	Standard capacitor, dry-nitrogen, two terminal-pair, decadic values	Capacitance standard, ratio bridge	10	1000	pF	Frequency	1 kHz	3 to 5	µF/F	2	95%	Yes		This CMC is related to the next one	53
Capacitance: dissipation factor for low loss capacitors	Standard capacitor, dry-nitrogen, two terminal-pair, decadic values	Capacitance standard, ratio bridge	5E-06	5E-05		Capacitance	10 pF, 100 pF, 1 nF	7E-06 to 9E-06		2	95%	No		This CMC is related to the previous one	74
						Frequency	1 kHz								

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

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Capacitance: low loss capacitors	Standard capacitor, dry-nitrogen, two terminal-pair, decadic values	Capacitance standard, ratio bridge	1	1000	pF	Frequency	100 Hz to 16 kHz	10 to 60	µF/F	2	95%	Yes	Matrix 4.2		54
Capacitance: low loss capacitors	Standard capacitor, dry-nitrogen, three terminal	Substitution	10	1000	pF	Frequency	10 kHz to 1 MHz	30 to 700	µF/F	2	95%	Yes	Matrix 4.3		55
Capacitance: dielectric capacitors	Fixed capacitor, mica, polystyrene, four terminal-pair	Capacitance standard, ratio bridge	0.001	10000	µF	Frequency	50 Hz to 10 kHz	30 to 500	µF/F	2	95%	Yes	Matrix 4.4	This CMC is related to the next one	64
Capacitance: dissipation factor for dielectric capacitors	Fixed capacitor, mica, four terminal-pair	Capacitance standard, ratio bridge	1E-04	5E-04		Capacitance	1 nF, 10 nF	1.5E-05 to 4E-05		2	95%	No		This CMC is related to the next one	75
						Frequency	100 Hz to 10 kHz								
Capacitance: dissipation factor for dielectric capacitors	Fixed capacitor, mica, four terminal-pair	Capacitance standard, ratio bridge	1E-04	1E-03		Capacitance	100 nF	2E-05 to 7E-05		2	95%	No		This CMC is related to the next one	76
						Frequency	100 Hz to 10 kHz								
Capacitance: dissipation factor for dielectric capacitors	Fixed capacitor, mica, four terminal-pair	Capacitance standard, ratio bridge	1E-04	1E-03		Capacitance	1 µF	4E-05 to 1E-04		2	95%	No		This CMC is related to the next one	77
						Frequency	100 Hz to 10 kHz								
Capacitance: dissipation factor for dielectric capacitors	Fixed capacitor, four terminal-pair	Capacitance standard, ratio bridge	1E-04	5E-03		Capacitance	10 µF	7E-05 to 2E-04		2	95%	No		This CMC is related to the next one	78
						Frequency	100 Hz to 10 kHz								

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

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Capacitance: dissipation factor for dielectric capacitors	Fixed capacitor, four terminal-pair	Capacitance standard, ratio bridge	1E-04	5E-03		Capacitance	100 µF, 1 mF	1E-04 to 3E-04		2	95%	No		This CMC is related to the previous ones	79
						Frequency	100 Hz to 1 kHz								
Inductance: self inductance, low values	Toroidal fixed inductor, 1-2-5 sequence	Maxwell bridge	1	500	µH	Frequency	100 Hz to 1 MHz	60 to 4000	µH/H	2	95%	Yes	Matrix 4.5		80
Inductance: self inductance, intermediate values	Toroidal fixed thermostated inductor	Maxwell bridge	10	10	mH	Frequency	1000 Hz, 1592 Hz	10	µH/H	2	95%	Yes			93
Inductance: self inductance, intermediate values	Toroidal fixed inductor, 1-2-5 sequence	Maxwell bridge	1	500	mH	Frequency	50 Hz to 100 kHz	40 to 450	µH/H	2	95%	Yes	Matrix 4.5		94
Inductance: self inductance, high values	Toroidal fixed inductor, 1-2-5 sequence	Maxwell bridge	1	10	H	Frequency	50 Hz to 2 kHz	50 to 150	µH/H	2	95%	Yes	Matrix 4.5		106
Inductance: self inductance, high values	Toroidal fixed inductor	Maxwell bridge	100	100	H	Frequency	50 Hz to 400 Hz	100 to 500	µH/H	2	95%	Yes	Matrix 4.5		113
AC voltage: AC-DC transfer difference at low voltages	Thermal voltage converters with amplifiers, micropotentiometers	Comparison	0.002	0.5	V	Frequency	10 Hz to 1 MHz	3 to 270	µV/V	2	95%	Yes	Matrix 5.1		117a
AC voltage: AC-DC transfer difference at medium voltages	Thermal voltage converters	Comparison	0.5	5	V	Frequency	10 Hz to 1 MHz	1 to 50	µV/V	2	95%	Yes	Matrix 5.1		124a
AC voltage: AC-DC transfer difference at higher voltages	Thermal converters with range extenders	Comparison	5	1000	V	Frequency	10 Hz to 1 MHz	1 to 40	µV/V	2	95%	Yes	Matrix 5.1		144a
AC voltage up to 1000 V: meters	AC voltmeter, multimeter, multifunction transfer standard	AC-DC transfer	0.1	1000	V	Frequency	10 Hz to 1 MHz	10 to 300	µV/V	2	95%	Yes	Matrix 5.2		260a

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AC voltage ratio: real component	One-decade inductive voltage divider with 11, 10 or 8 taps	Comparison with reference divider	0.09090...	1		Frequency	75 Hz to 1 kHz	0.01 to 0.05	1E-06	2	95%	No		Minimum step depends on the type of divider This CMC is related to the next one	297
						Maximum voltage	26 V								
AC voltage ratio: imaginary component	One-decade inductive voltage divider with 11, 10 or 8 taps	Comparison with reference divider	0.09090...	1		Frequency	75 Hz to 1 kHz	0.02 to 0.1	1E-06	2	95%	No		Minimum step depends on the type of divider This CMC is related to the previous one	314
						Maximum voltage	26 V								
AC voltage ratio: real component	Inductive voltage divider	Comparison with reference divider	1E-08	1		Frequency	75 Hz to 1 kHz	0.1	1E-06	2	95%	No			298
						Maximum voltage	26 V								
AC voltage ratio: real component	Inductive voltage divider	Comparison with reference divider	1E-08	1		Frequency	75 Hz	0.02	1E-06	2	95%	No			299
						Voltage	1 V								
AC voltage ratio: real component	One-decade inductive voltage divider with 11, 10 or 8 taps	Comparison with reference divider	0.09090...	1		Frequency	50 Hz to 60 Hz	0.05	1E-06	2	95%	No		Minimum step depends on the type of divider This CMC is related to the next one	300
						Maximum voltage	200 V								
AC voltage ratio: imaginary component	One-decade inductive voltage divider with 11, 10 or 8 taps	Comparison with reference divider	0.09090...	1		Frequency	50 Hz to 60 Hz	0.1	1E-06	2	95%	No		Minimum step depends on the type of divider This CMC is related to the previous one	315
						Maximum voltage	200 V								
AC voltage ratio: real component	Inductive voltage divider	Comparison with reference divider	1E-08	1		Frequency	50 Hz to 60 Hz	0.1	1E-06	2	95%	No			301
						Maximum voltage	200 V								
AC voltage ratio: real component	Bridge standard for strain-gauge measurements	Comparison with reference divider	0	2	mV/V	Frequency	225 Hz to 600 Hz	0.01	μV/V	2	95%	No		This CMC is related to the next one	305
						Maximum voltage	10 V								

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

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AC voltage ratio: real component	Bridge standard for strain-gauge measurements	Comparison with reference divider	0	2	mV/V	Frequency	4.8 kHz	0.1	µV/V	2	95%	No		This CMC is related to the previous one	306
						Maximum voltage	10 V								
AC voltage ratio: real component	Bridge standard for strain-gauge measurements	Comparison with reference divider	2	40	mV/V	Frequency	225 Hz to 600 Hz	0.01 to 0.14	µV/V	2	95%	No		This CMC is related to the next one	307
						Maximum voltage	10 V								
AC voltage ratio: real component	Bridge standard for strain-gauge measurements	Comparison with reference divider	2	40	mV/V	Frequency	4.8 kHz	0.1 to 1.4	µV/V	2	95%	No		This CMC is related to the previous one	308
						Maximum voltage	10 V								
AC voltage ratio: real component	Bridge standard for strain-gauge measurements	Comparison with reference divider	40	1000	mV/V	Frequency	225 Hz to 600 Hz	0.14	µV/V	2	95%	No		This CMC is related to the next one	309
						Maximum voltage	10 V								
AC voltage ratio: real component	Bridge standard for strain-gauge measurements	Comparison with reference divider	40	1000	mV/V	Frequency	4.8 kHz	1.4	µV/V	2	95%	No		This CMC is related to the previous one	310
						Maximum voltage	10 V								
AC voltage ratio: real component: resistance ratio	Universal AC-thermometry bridge	Comparison with reference divider	0	3.9999...		Frequency	75 Hz	0.5	1E-06	2	95%	No			311
						Voltage	1 V								
AC voltage ratio: real component: resistance ratio	Special AC-thermometry bridge	Comparison with reference divider	0	1.2999...		Frequency	75 Hz	0.1	1E-06	2	95%	No			312
						Voltage	1 V								
AC voltage ratio: real component: angle	Synchro-resolver bridge	Comparison with reference divider	0	2π	rad	Frequency	400 Hz	3	µrad	2	95%	No			313
						Maximum voltage	26 V								
AC voltage ratio: attenuation	600-Ω-attenuator-boxes	Comparison with reference divider	0	60	dB	Frequency	1 kHz	0.005	dB	2	95%	No		This CMC is related to the next one	302
						Maximum voltage	10 V								

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
AC voltage ratio: attenuation	600- Ω -attenuator-boxes	Comparison with reference divider	60	90	dB	Frequency	1 kHz	0.01	dB	2	95%	No		This CMC is related to the next one	303
						Maximum voltage	10 V								
AC voltage ratio: attenuation	600- Ω -attenuator-boxes	Comparison with reference divider	90	100	dB	Frequency	1 kHz	0.05	dB	2	95%	No		This CMC is related to the previous ones	304
						Maximum voltage	10 V								
AC current: AC-DC transfer difference	Thermal current converters	AC-DC transfer	0.003	20	A	Frequency	10 Hz to 100 kHz	3 to 100	μ A/A	2	95%	Yes	Matrix 6.1		316a
AC current up to 100 A: meters	Current meter	Direct comparison	5	50	mA	Frequency	40 Hz to 70 Hz	80	μ A/A	2	95%	Yes			374
AC current up to 100 A: meters	Current meter	Direct comparison	0.05	10	A	Frequency	40 Hz to 100 Hz	60	μ A/A	2	95%	Yes			375
AC current up to 100 A: meters	Current meter	Direct comparison	0.05	10	A	Frequency	100 Hz to 1 kHz	150	μ A/A	2	95%	Yes			376
AC current up to 100 A: meters	Current meter	Direct comparison	10	160	A	Frequency	40 Hz to 70 Hz	80	μ A/A	2	95%	Yes			377
AC power and energy: single phase ($f \leq 400$ Hz), active power	Power meter, power converter, power comparator	Direct comparison	0	2400	W	Voltage	60 V, 120 V, and 240 V	10	μ W/VA	2	95%	Yes			378
						Current	0.5 A, 1 A, 2.5 A, 5 A, and 10 A								
						Power factor	1 to 0, inductive or capacitive								
						Frequency	45 Hz to 65 Hz								
AC power and energy: single phase ($f \leq 400$ Hz), reactive power	Power meter, power converter, power comparator	Direct comparison	0	2400	var	Voltage	60 V, 120 V, and 240 V	10	μ var/VA	2	95%	Yes			379
						Current	0.5 A, 1 A, 2.5 A, 5 A, and 10 A								
						Power factor	1 to 0, inductive or capacitive								
						Frequency	45 Hz to 65 Hz								

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
AC power and energy: single phase ($f \leq 400$ Hz), apparent power	Power meter, power converter, power comparator	Direct comparison	30	2400	VA	Voltage	60 V, 120 V, and 240 V	10	μVA/VA	2	95%	Yes			380
						Current	0.5 A, 1 A, 2.5 A, 5 A, and 10 A								
						Power factor	1 to 0, inductive or capacitive								
						Frequency	45 Hz to 65 Hz								
AC power and energy: single phase ($f \leq 400$ Hz), active power	Power meter, power converter, power comparator	Direct comparison	0	1200	W	Voltage	60 V to 240 V	20	μW/VA	2	95%	Yes			381
						Current	0.5 A to 5 A								
						Power factor	1 to 0, inductive or capacitive								
						Frequency	45 Hz to 65 Hz								
AC power and energy: single phase ($f \leq 400$ Hz), active power	Power meter, power converter, power comparator	Direct comparison	0.06	25	W	Voltage	50 V to 500 V	80	μW/VA	2	95%	Yes			382
						Current	5 mA to 50 mA								
						Power factor	1 to 0.25, inductive or capacitive								
						Frequency	45 Hz to 65 Hz								
AC power and energy: single phase ($f \leq 400$ Hz), active power	Power meter, power converter, power comparator	Direct comparison	1.25	5000	W	Voltage	50 V to 500 V	100	μW/VA	2	95%	Yes			383
						Current	0.05 A to 10 A								
						Power factor	1 to 0.5, inductive or capacitive								
						Frequency	65 Hz to 400 Hz								

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
AC power and energy: single phase ($f > 400$ Hz), active power	Power meter, power converter	Direct comparison	1	5000	W	Voltage	50 V to 500 V	200	μW/VA	2	95%	Yes			386
						Current	0.05 A to 10 A								
						Power factor	1 to 0.5, inductive or capacitive								
						Frequency	400 Hz to 1 kHz								
AC power and energy: single phase ($f > 400$ Hz), active power	Power meter, power converter	Direct comparison	2	3000	W	Voltage	50 V to 300 V	1	mW/VA	2	95%	Yes			387
						Current	0.05 A to 10 A								
						Power factor	1								
						Frequency	1 kHz to 10 kHz								
AC power and energy: three phase, active power	Power meter, power converter	Direct comparison	1	2500	W	Voltage	50 V to 250 V	1	mW/VA	2	95%	Yes		Single-phase measurements are included. Range values per phase	388
						Current	0.05 A to 10 A								
						Power factor	1 to 0.5, inductive or capacitive								
						Frequency	16 2/3 Hz								
AC power and energy: three phase, active power	Power meter, power converter, power comparator	Direct comparison	0.5	5000	W	Voltage	50 V to 500 V	60	μW/VA	2	95%	Yes		Single-phase measurements are included. Range values per phase	389
						Current	0.05 A to 10 A								
						Power factor	1 to 0.25, inductive or capacitive								
						Frequency	45 Hz to 65 Hz								
AC power and energy: three phase, active power	Power meter, power converter, power comparator	Direct comparison	0.1	80	kW	Voltage	50 V to 500 V	80	μW/VA	2	95%	Yes		Single-phase measurements are included. Range values per phase	390
						Current	10 A to 160 A								

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
						Power factor	1 to 0.25, inductive or capacitive								
						Frequency	45 Hz to 65 Hz								
AC power and energy: three phase, reactive power	Power meter, power comparator	Direct comparison	0.5	5000	var	Voltage	50 V to 500 V	80	μvar/Va	2	95%	Yes		Single-phase measurements are included. Range values per phase	391
						Current	0.05 A to 10 A								
						Reactive power factor	1 i/c to 0.25, inductive or capacitive								
						Frequency	45 Hz to 65 Hz								
AC power and energy: three phase, active energy	Energy meter	Direct comparison	0.05	2.5E+05	Ws	Voltage	50 V to 250 V	1	mWh/VAh	2	95%	Yes		Single-phase measurements are included. Range values per phase	392
						Current	0.005 A to 10 A								
						Power factor	1 to 0.25, inductive or capacitive								
						Frequency	16 2/3 Hz								
						Measurement time	1 s to 100 s								
AC power and energy: three phase, active energy	Energy meter	Direct comparison	0.05	8E+06	Ws	Voltage	50 V to 500 V	100	μWh/VAh	2	95%	Yes		Single-phase measurements are included. Range values per phase	393
						Current	0.005 A to 160 A								
						Power factor	1 to 0.25, inductive or capacitive								
						Frequency	45 Hz to 65 Hz								
						Measurement time	1 s to 100 s								
AC power and energy: three phase, reactive energy	Energy meter	Direct comparison	0.05	8E+06	vars	Voltage	50 V to 500 V	500	μvarh/VAh	2	95%	Yes		Single-phase measurements are included. Range values per phase	394
						Current	0.005 A to 160 A								

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
						Reactive power factor	1 to 0.25, inductive or capacitive								
						Frequency	45 Hz to 65 Hz								
						Measurement time	1 s to 100 s								
High DC voltage: high voltage sources	High DC voltage supply	Direct measurement with reference system	-400	400	kV	Minimum source output current	0.1 mA to 0.5 mA	2E-06 to 1E-04		2	95%	Yes	Matrix 8.1		394a
High DC voltage: high voltage meters	Measuring system for high DC voltage	Comparison with reference system	-100	300	kV	Current	up to 10 mA	2E-06 to 1E-05		2	95%	Yes	Matrix 8.2		395
High DC voltage: ratios	High voltage resistive divider	Comparison with reference divider	3.3E-06	1		Voltage	-100 kV to 300 kV	2E-06 to 1E-05		2	95%	Yes	Matrix 8.3		395a
						Current	up to 10 mA								
High voltage impedance: capacitance	High voltage capacitor	Comparison with reference	10	1000	pF	Voltage	1 kV to 800 kV	1E-05 to 1E-04		2	95%	Yes	Matrix 8.4	This CMC is related to the next one	396
						Frequency	15 Hz to 400 Hz								
High voltage impedance: capacitance dissipation factor	High voltage capacitor	Comparison with reference	1E-05	1E-03		Frequency	50 Hz, 1000 Hz	1E-05 to 3E-05		2	95%	No	Matrix 8.5	This CMC is related to the previous one	397
						Capacitance	10 pF to 1000 pF								
High voltage impedance: burden: modulus	Standard burden for instrument transformers	Impedance measuring set	0.01	10000	Ω	Current	0.025 A to 10 A	1E-03 to 1E-02		2	95%	Yes	Matrix 8.6	This CMC is related to the next one	398
						Voltage	40 mV to 320 V								
						Frequency	16.7 Hz, 50 Hz, 60 Hz								
High voltage impedance: burden: argument	Standard burden for instrument transformers	Impedance measuring set	-1.57	1.57	rad	Current	0.025 A to 10 A	1 to 10	mrad	2	95%	No	Matrix 8.7	This CMC is related to the previous one	399
						Voltage	40 mV to 320 V								
						Frequency	16.7 Hz, 50 Hz, 60 Hz								

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
AC high voltage: sources	High voltage AC sources	Direct measurement with reference system	1	800	kV	Frequency	15 Hz to 400 Hz	5E-05 to 1E-04		2	95%	Yes	Matrix 8.8		400
AC high voltage: meters	AC divider, AC measuring system	Comparison with reference system	1	800	kV	Frequency	15 Hz to 400 Hz	5E-05 to 5E-04		2	95%	Yes	Matrix 8.9		401
AC high voltage: peak values	AC divider, AC measuring system	Comparison with reference system	1	800	kV	Frequency	15 Hz to 400 Hz	5E-05 to 1E-04		2	95%	Yes	Matrix 8.10		402
AC high voltage: ratio error	Voltage transformer test set	Instrument transformer test set calibrator	0	0.02		Voltage	23 V to 138 V	1E-04		2	95%	No		This CMC is related to the next one	403
						Frequency	16.7 Hz								
AC high voltage: ratio: phase displacement	Voltage transformer test set	Instrument transformer test set calibrator	0	20	mrad	Voltage	23 V to 138 V	100	µrad	2	95%	No		This CMC is related to the previous one	410
						Frequency	16.7 Hz								
AC high voltage: ratio error	Voltage transformer test set	Instrument transformer test set calibrator	0	0.02		Voltage	23 V to 138 V	1E-05		2	95%	No		This CMC is related to the next one	403a
						Frequency	50 Hz, 60 Hz								
AC high voltage: ratio: phase displacement	Voltage transformer test set	Instrument transformer test set calibrator	0	20	mrad	Voltage	23 V to 138 V	10	µrad	2	95%	No		This CMC is related to the previous one	410
						Frequency	16.7 Hz, 50 Hz, 60 Hz								
AC high voltage: ratio error	Voltage transformer	Comparison with reference standard	0	0.02		Voltage	100 V to 300 kV	5E-06 to 1E-04		2	95%	No	Matrix 8.11	According to IEC 60044-2 This CMC is related to the next one	404
						Frequency	16.7 Hz, 50 Hz, 60 Hz								
AC high voltage: ratio: phase displacement	Voltage transformer	Comparison with reference standard	0	20	mrad	Voltage	100 V to 300 kV	5 to 100	µrad	2	95%	No	Matrix 8.12	According to IEC 60044-2 This CMC is related to the previous one	407
						Frequency	16.7 Hz, 50 Hz, 60 Hz								

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
Pulsed high voltage and current: lightning impulse voltage parameters	Impulse calibrator, digital recorder: peak value	Direct measurement with digital recorder, comparison with digital recorder	10	1600	V			3E-03		2	95%	Yes		According to IEC 61083	411
Pulsed high voltage and current: lightning impulse voltage parameters	High voltage divider, high voltage measuring system: peak value	Comparison with high voltage reference measuring system	1	300	kV			4E-03		2	95%	Yes		According to IEC 60060	412
Pulsed high voltage and current: lightning impulse voltage parameters	High voltage divider, high voltage measuring system: peak value	Comparison with high voltage reference measuring system	301	1500	kV			5E-03		2	95%	Yes		According to IEC 60060	412a
Pulsed high voltage and current: lightning impulse time parameters	Impulse calibrator, digital recorder: front time, time to half value, time to chopping	Direct measurement with digital recorder, comparison with digital recorder	0.5	60	μs	Peak value	10 V to 1600 V	1E-02		2	95%	Yes		According to IEC 61083	413
Pulsed high voltage and current: lightning impulse time parameters	High voltage divider, high voltage measuring system: front time, time to half value, time to chopping	Comparison with high voltage reference measuring system	0.5	60	μs	Peak value	1 kV to 1500 kV	2E-02		2	95%	Yes		According to IEC 60060	414
Pulsed high voltage and current: switching impulse voltage parameters	Impulse calibrator, digital recorder: peak value	Direct measurement with digital recorder, comparison with digital recorder	10	1600	V			3E-03		2	95%	Yes		According to IEC 61083	415

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
Pulsed high voltage and current: switching impulse voltage parameters	High voltage divider, high voltage measuring system: peak value	Comparison with high voltage reference measuring system	1	300	kV			4E-03		2	95%	Yes		According to IEC 60060	416
Pulsed high voltage and current: switching impulse voltage parameters	High voltage divider, high voltage measuring system: peak value	Comparison with high voltage reference measuring system	301	1500	kV			4E-03		2	95%	Yes		According to IEC 60060	416a
Pulsed high voltage and current: switching impulse time parameters	Impulse calibrator, digital recorder: time to peak, time to half value	Direct measurement with digital recorder, comparison with digital recorder	10	4000	μs	Peak value	10 V to 1600 V	1E-02		2	95%	Yes		According to IEC 61083	417
Pulsed high voltage and current: switching impulse time parameters	High voltage divider, high voltage measuring system: time to peak, time to half value	Comparison with high voltage reference measuring system	100	2500	μs	Peak value	1 kV to 1500 kV	2E-02		2	95%	Yes		According to IEC 60060	418
Pulsed high voltage and current: impulse current parameters	Shunt, coil: peak value	Comparison with reference impulse current measuring system	50	5000	A			5E-03		2	95%	Yes		According to IEC 60060	419
Pulsed high voltage and current: impulse current parameters	Shunt, coil: peak value	Comparison with reference impulse current measuring system	5001	20000	A			6E-03		2	95%	Yes		According to IEC 60060	419a
Pulsed high voltage and current: impulse current time parameters	Shunt, coil: front time	Comparison with reference impulse current measuring system	8	20	μs	Peak value	50 A to 5000 A	1.3E-02		2	95%	Yes		According to IEC 60060	420

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
Pulsed high voltage and current: impulse current time parameters	Shunt, coil: front time	Comparison with reference impulse current measuring system	8	20	μs	Peak value	5001 A to 20000 A	1.5E-02		2	95%	Yes		According to IEC 60060	420a
Pulsed high voltage and current: response parameters: response time	Impulse divider	Direct measurement with digital recorder	1	1000	ns	Step voltage	10 V to 500 V	5	ns	2	95%	No		According to IEC 60060 <i>This CMC is related to the next one</i>	421
Pulsed high voltage and current: response parameters: overshoot	Impulse divider	Direct measurement with digital recorder	1E-02	1		Step voltage	10 V to 500 V	5E-02		2	95%	No		According to IEC 60060 <i>This CMC is related to the next one</i>	422
Pulsed high voltage and current: response parameters: settling time	Impulse divider	Direct measurement with digital recorder	1	1000	ns	Step voltage	10 V to 500 V	20	ns	2	95%	No		According to IEC 60060 <i>This CMC is related to the previous ones</i>	423
Electric discharge: apparent charge	Partial discharge calibrator: charge q	Direct measurement with digital recorder	1	5000	pC	Impulse width	0.5 ns to 500 μs	(0.2 + 0.02 q), q in pC	pC	2	95%	No		According to IEC 60270	424
High AC current: ratio error	Current transformer test set	Instrument transformer test set calibrator	0	0.02		Current	0.05 A to 10 A	1E-04		2	95%	No		<i>This CMC is related to the next one</i>	425
						Frequency	16.7 Hz								
High AC current: ratio: phase displacement	Current transformer test set	Instrument transformer test set calibrator	0	20	mrad	Current	0.05 A to 10 A	100	μrad	2	95%	No		<i>This CMC is related to the previous one</i>	434
						Frequency	16.7 Hz								
High AC current: ratio error	Current transformer test set	Instrument transformer test set calibrator	0	0.02		Current	0.05 A to 10 A	1E-05		2	95%	No		<i>This CMC is related to the next one</i>	425a
						Frequency	50 Hz, 60 Hz								

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
High AC current: ratio: phase displacement	Current transformer test set	Instrument transformer test set calibrator	0	20	mrad	Current	0.05 A to 10 A	10	µrad	2	95%	No		This CMC is related to the previous one	434a
						Frequency	50 Hz, 60 Hz								
High AC current: ratio error	Current transformer	Comparison with reference standard	0	0.02		Current	0.05 A to 100 kA	5E-06 to 3E-05		2	95%	No	Matrix 8.13	According to IEC 60044-1 This CMC is related to the next one	426
						Frequency	16.7 Hz, 50 Hz, 60 Hz								
High AC current: ratio: phase displacement	Current transformer	Comparison with reference standard	0	20	mrad	Current	0.05 A to 100 kA	5 to 50	µrad	2	95%	No	Matrix 8.14	According to IEC 60044-1 This CMC is related to the previous one	430
						Frequency	16.7 Hz, 50 Hz, 60 Hz								
Phase angle: meters	Phase meter	Comparison with reference meter	0	360	°	Frequency	10 Hz to 1 kHz	0.001	°	2	95%	No			645
						Voltage	0.1 V to 7 V								
Electric fields below 50 kHz: electric field strength	Field strength probes	Field strength test-set according to IEC 833	0.1	30	kV/m	Frequency	16 Hz to 2 kHz	5E-03		2	95%	Yes			435
Magnetic fields below 50 kHz: magnetic flux, voltage-time integral	Flux meters, flux etalon	Reference mutual inductor and current source	1E-05	0.02	Vs			1E-03		2	95%	Yes			627
Magnetic fields below 50 kHz: magnetic flux, voltage-time integral	Flux meters, flux etalon	Digital voltage-time source	0.02	0.2	Vs			1E-03		2	95%	Yes			628
Magnetic fields below 50 kHz: magnetic flux, voltage-time integral	Flux meters, flux etalon	Fluxmeter	0.01	0.1	Vs			1E-03		2	95%	Yes			629

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
Magnetic fields below 50 kHz: magnetic flux, voltage-time integral	Fluxmeter, electronic integrator	Rectangular voltage source, sampling of the output voltage, and determination of the slopes	1E-04	0.2	Vs			7.5 to 3.5	1E-05	2	95%	Yes			629a
Magnetic fields below 50 kHz: magnetic flux, time constant	Fluxmeter, electronic integrator	Rectangular voltage source, sampling of the output voltage, and determination of the slopes	1E-03	1	s			7.5 to 3.5	1E-05	2	95%	Yes			629b
Magnetic fields below 50 kHz: DC magnetic flux density	Field coil: solenoid, Helmholtz coil or other	Nuclear magnetic resonance: free precession	0.8	2.0	mT	Coil current	0.1 A or 1 A	2	nT	2	95%	No			436
						Relative field inhomogeneity at centre region +/- 2 cm	< 1E-06								
Magnetic fields below 50 kHz: DC magnetic flux density	Field coil: solenoid, Helmholtz coil or other	Nuclear magnetic resonance: free precession	0.01	2.0	mT	Coil current	0.01 A to 2 A	20 to 50	nT	2	95%	No			437
						Relative field inhomogeneity at centre region +/- 2 cm	< 1E-05								
Magnetic fields below 50 kHz: DC magnetic flux density	Field coil: solenoid, Helmholtz coil or other	Nuclear magnetic resonance: energy absorption	0.5	150	mT	Coil current	< 10 A	0.05 to 6	µT	2	95%	No			438
						Relative field inhomogeneity at centre region +/- 2 cm	< 1E-04								

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
Magnetic fields below 50 kHz: DC magnetic flux density	Field coils, permanent magnets	Comparison with field of standard coil	1E-04	150	mT	Coil current	< 10 A	1 to 10	mT/T	2	95%	Yes		Uncertainty depends on coil design and field value, in general: relative uncertainty as stated	439
Magnetic fields below 50 kHz: DC magnetic flux density, field profile along the axis	Field coil: flux density values	SQUID magnetometer, position: interferometric	1E-04	2	mT	Coil current	< 1 A	3	nT	2	95%	No		Uncertainty depends on method, coil design and maximum field value, in general: uncertainty as stated	440a
Magnetic fields below 50 kHz: DC magnetic flux density, field profile along the axis	Field coil: position values	SQUID magnetometer, position: interferometric	0	600	mm	Flux density	0.0001 mT to 2 mT	1 to 10	μm	2	95%	No		Uncertainty depends on method, coil design and maximum field value, in general: uncertainty as stated	440b
						Coil current	< 1 A								
Magnetic fields below 50 kHz: DC magnetic flux density, field profile along the axis	Field coil: flux density values	Flux gate magnetometer, position: optical	1E-04	5	mT	Coil current	< 1 A	10	nT	2	95%	No		Uncertainty depends on method, coil design and maximum field value, in general: uncertainty as stated	440c
Magnetic fields below 50 kHz: DC magnetic flux density, field profile along the axis	Field coil: position values	Flux gate magnetometer, position: optical	0	400	mm	Flux density	0.0001 mT to 5 mT	2 to 20	μm	2	95%	No		Uncertainty depends on method, coil design and maximum field value, in general: uncertainty as stated	440d
						Coil current	< 1 A								
Magnetic fields below 50 kHz: DC magnetic flux density	Magnetometer: any type	Field coils based on NMR	1E-04	150	mT			0.05 to 10	mT/T	2	95%	Yes		Uncertainty depends on type and sensor design, in general: relative uncertainty as stated	441
Magnetic fields below 50 kHz: DC magnetic field strength	Field measuring devices, transversal probes	Calibration by NMR	1.6E+04	1.2E+06	A/m			0.1E-03		2	95%	Yes			459
Magnetic fields below 50 kHz: DC magnetic field strength	Field measuring devices, axial probes	Calibration in a solenoidal coil	1.6E+04	1.6E+05	A/m			1E-03		2	95%	Yes			460

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
Magnetic fields below 50 kHz: DC magnetic field strength	Reference magnet with air gap	Hall probe, NMR	800	1.2E+06	A/m			5E-03		2	95%	Yes			442
Magnetic fields below 50 kHz: DC magnetic field strength	Reference magnet with axial boring	Hall probe, NMR	800	1.6E+05	A/m			5E-03		2	95%	Yes			443
Magnetic fields below 50 kHz: AC magnetic flux density	Magnetometer: any type	Field coils: $k(f)$ related to $k(f = 0)$ by search coils	1	800	μ T	Frequency	< 20 Hz	20 to 1	1E-03	2	95%	Yes		Uncertainty depends on type and sensor design, in general: relative uncertainty as stated	446
						Sensor diameter	< 100 mm								
Magnetic fields below 50 kHz: AC magnetic flux density	Magnetometer: any type	Field coils: $k(f)$ related to $k(f = 0)$ by search coils	1	500	μ T	Frequency	< 300 Hz	20 to 1	1E-03	2	95%	Yes		Uncertainty depends on type and sensor design, in general: relative uncertainty as stated	447
						Sensor diameter	< 100 mm								
Magnetic fields below 50 kHz: AC magnetic flux density	Magnetometer: any type: f in kHz	Field coils: $k(f)$ related to $k(f = 0)$ by search coils	1	150/f	μ T	Frequency	< 30 kHz	20 to 1	1E-03	2	95%	Yes		Uncertainty depends on type and sensor design, in general: relative uncertainty as stated	448
						Sensor diameter	< 100 mm								
Magnetic fields below 50 kHz: shielding factor in DC field	Magnetic shell	Flux gate or SQUID	0	80	dB	Maximum field	1 mT	1 to 10	dB	2	95%	No		Shell must fit inside a sphere of 30 cm in diameter, uncertainty depends on design and dimensions of the shell, in general: uncertainty as stated	450
Magnetic fields below 50 kHz: shielding factor and its profile in DC field	Magnetic shell	Flux gate or SQUID	0	80	dB	Maximum field	100 μ T	1 to 10	dB	2	95%	No		Shell must fit inside a sphere of 80 cm in diameter, uncertainty depends on design and dimensions of the shell, in general: uncertainty as stated	451
Magnetic fields below 50 kHz: shielding factor in AC field	Magnetic shell	Search coils	0	80	dB	Frequency	< 20 Hz	1 to 10	dB	2	95%	No		Shell must fit inside a sphere of 30 cm in diameter, uncertainty depends on design and dimensions of the shell, in general: uncertainty as stated	452

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
						Maximum field	0.8 mT								
Magnetic fields below 50 kHz: shielding factor in AC field	Magnetic shell	Search coils	0	80	dB	Frequency	< 300 Hz	1 to 10	dB	2	95%	No		Shell must fit inside a sphere of 30 cm in diameter, uncertainty depends on design and dimensions of the shell, in general: uncertainty as stated	453
						Maximum field	0.5 mT								
Magnetic fields below 50 kHz: shielding factor in AC field	Magnetic shell	Search coils	0	80	dB	Frequency	< 30 kHz	1 to 10	dB	2	95%	No		Shell must fit inside a sphere of 30 cm in diameter, uncertainty depends on design and dimensions of the shell, in general: uncertainty as stated	454
						Maximum field	150 µT/f, f in kHz								
Magnetic fields below 50 kHz: shielding factor in AC field	Magnetic shell	Search coils	0	80	dB	Frequency	> 30 kHz	1 to 10	dB	2	95%	No		Shell must fit inside a sphere of 30 cm in diameter, uncertainty depends on design and dimensions of the shell, in general: uncertainty as stated	455
						Maximum field	on request								
Magnetic fields below 50 kHz: turn area, mean diameter of circular turns	Flat sensing coil	Calculated from field profile (if the coil is used to produce a field), the number of turns must be known	10	30	cm			1 to 10	1E-03	2	95%	Yes		Uncertainty depends on cross-section of winding, in general: relative uncertainty as stated	456
Magnetic fields below 50 kHz: turn area	Sensing coils	Fluxmeter and NMR	2E-03	0.2	m ²			1E-03		2	95%	Yes			457
Magnetic fields below 50 kHz: turn area	Sensing coils	Comparison against reference coil in AC field	1E-04	2E-03	m ²			5E-03		2	95%	Yes			458
Magnetic fields below 50 kHz: AC magnetic flux density per unit current	Field coil: k(f) /k(f = 0), coil constant k, frequency f	Search coils	1	10		Coil current	< 2 A	1 to 3	1E-03	2	95%	Yes		Measurand depends on impedance of field coil and frequency. Uncertainty depends on coil design and field value, in general: relative uncertainty as stated	444

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
						Maximum voltage	140 V								
						Frequency	< 2 kHz								
Magnetic fields below 50 kHz: AC magnetic flux density per unit current	Field coil: $k(f) / k(f = 0)$, coil constant k , frequency f	Search coils	1	10		Coil current	< 0.5 A	3 to 10	1E-03	2	95%	Yes		Measurand depends on impedance of field coil and frequency. Uncertainty depends on coil design and field value, in general: relative uncertainty as stated	445
						Maximum voltage	40 V								
						Frequency	< 30 kHz								
Electromagnetic fields above 50 kHz: electric field strength (far field)	Field strength meter	TEM-cell	1	600	V/m	Frequency	10 kHz to 100 MHz	7	%	2	95%	Yes			461
Electromagnetic fields above 50 kHz: electric field strength (far field)	Field strength meter	GTEM-cell	1	100	V/m	Frequency	1 MHz to 1000 MHz	12	%	2	95%	Yes			462
Electromagnetic fields above 50 kHz: electric field strength (far field)	Transfer sensor	μ TEM-cell	1	200	V/m	Frequency	1 MHz to 1000 MHz	5	%	2	95%	Yes			465
Electromagnetic fields above 50 kHz: magnetic field strength (far field)	Field strength meter	TEM-cell	3.0E-03	1.5	A/m	Frequency	10 kHz to 100 MHz	7	%	2	95%	Yes			466
RF power: effective efficiency on coaxials	Barretters, thermistors: 50 Ω , G900, N, PC7	DC substitution in microcalorimeter	0.9	1		Power level	1 mW to 10 mW	0.003		2	95%	No			468
						Frequency	10 MHz to 8 GHz								
RF power: effective efficiency on coaxials	Barretters, thermistors: 50 Ω , N, PC7	DC substitution in microcalorimeter	0.9	1		Power level	1 mW to 10 mW	0.004		2	95%	No			469
						Frequency	8 GHz to 18 GHz								

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
RF power: effective efficiency on coaxials	Barretters, modified power sensor: 50 Ω, PC3.5	DC substitution in microcalorimeter	0.9	1		Power level	1 mW to 10 mW	0.004		2	95%	No			470
						Frequency	10 MHz to 0.6 GHz								
RF power: effective efficiency on coaxials	Barretters, modified power sensor: 50 Ω, PC3.5	DC substitution in microcalorimeter	0.9	1		Power level	1 mW to 10 mW	0.007		2	95%	No			470a
						Frequency	0.6 GHz to 5 GHz								
RF power: effective efficiency on coaxials	Barretters, modified power sensor: 50 Ω, PC3.5	DC substitution in microcalorimeter	0.9	1		Power level	1 mW to 10 mW	0.009		2	95%	No			470b
						Frequency	5 GHz to 12 GHz								
RF power: effective efficiency on coaxials	Barretters, modified power sensor: 50 Ω, PC3.5	DC substitution in microcalorimeter	0.9	1		Power level	1 mW to 10 mW	0.011		2	95%	No			470c
						Frequency	12 GHz to 20 GHz								
RF power: effective efficiency on coaxials	Barretters, modified power sensor: 50 Ω, PC3.5	DC substitution in microcalorimeter	0.9	1		Power level	1 mW to 10 mW	0.013		2	95%	No			470d
						Frequency	20 GHz to 22 GHz								
RF power: effective efficiency on coaxials	Barretters, modified power sensor: 50 Ω, PC3.5	DC substitution in microcalorimeter	0.9	1		Power level	1 mW to 10 mW	0.017		2	95%	No			470e
						Frequency	22 GHz to 26.5 GHz								
RF power: calibration factor on coaxials	Barretters, thermistors: 50 Ω, G900, N, PC7	DC substitution in microcalorimeter, reflection measurement	0.9	1		Power level	1 mW to 10 mW	0.004		2	95%	No			474
						Frequency	10 MHz to 8 GHz								

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
RF power: calibration factor on coaxials	Barretters, thermistors: 50Ω, N, PC7	DC substitution in microcalorimeter, reflection measurement	0.9	1		Power level	1 mW to 10 mW	0.006		2	95%	No			475
						Frequency	8 GHz to 18 GHz								
RF power: calibration factor on coaxials	Barretters, modified power sensor: 50Ω, PC3.5	DC substitution in microcalorimeter, reflection measurement	0.9	1		Power level	1 mW to 10 mW	0.004		2	95%	No			476
						Frequency	10 MHz to 0.6 GHz								
RF power: calibration factor on coaxials	Barretters, modified power sensor: 50Ω, PC3.5	DC substitution in microcalorimeter, reflection measurement	0.9	1		Power level	1 mW to 10 mW	0.008		2	95%	No			476a
						Frequency	0.6 GHz to 5 GHz								
RF power: calibration factor on coaxials	Barretters, modified power sensor: 50Ω, PC3.5	DC substitution in microcalorimeter, reflection measurement	0.9	1		Power level	1 mW to 10 mW	0.010		2	95%	No			476b
						Frequency	5 GHz to 12 GHz								
RF power: calibration factor on coaxials	Barretters, modified power sensor: 50Ω, PC3.5	DC substitution in microcalorimeter, reflection measurement	0.9	1		Power level	1 mW to 10 mW	0.012		2	95%	No			476c
						Frequency	12 GHz to 20 GHz								
RF power: calibration factor on coaxials	Barretters, modified power sensor: 50Ω, PC3.5	DC substitution in microcalorimeter, reflection measurement	0.9	1		Power level	1 mW to 10 mW	0.014		2	95%	No			476d
						Frequency	20 GHz to 22 GHz								

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
RF power: calibration factor on coaxials	Barretters, modified power sensor: 50 Ω, PC3.5	DC substitution in microcalorimeter, reflection measurement	0.9	1		Power level	1 mW to 10 mW	0.019		2	95%	No			476e
						Frequency	22 GHz to 26.5 GHz								
RF power: calibration factor on coaxials	Power sensors: 50 Ω, G900, N, PC3.5	Substitution	0.9	1		Power level	1 mW to 10 mW	0.001		2	95%	No			478a
						Frequency	DC to 1 MHz								
RF power: calibration factor on coaxials	Power sensors: 50 Ω, G900, N, PC3.5	Substitution	0.9	1		Power level	1 mW to 10 mW	0.0015		2	95%	No			478b
						Frequency	1 MHz to 30 MHz								
RF power: calibration factor on coaxials	Power sensors: 50 Ω, G900, N, PC3.5	Substitution	0.9	1		Power level	1 mW to 10 mW	0.002		2	95%	No			478c
						Frequency	30 MHz to 300 MHz								
RF power: calibration factor on coaxials	Power sensors: 50 Ω, G900, N, PC3.5	Substitution	0.9	1		Power level	1 mW to 10 mW	0.003		2	95%	No			478d
						Frequency	300 MHz to 600 MHz								
RF power: calibration factor on coaxials	Power sensors: 50 Ω, G900, N, PC3.5	Substitution	0.9	1		Power level	1 mW to 10 mW	0.004		2	95%	No			478e
						Frequency	600 MHz to 1.4 GHz								
RF power: calibration factor on coaxials	Power sensors: 50 Ω, G900, N, PC3.5	Substitution	0.9	1		Power level	1 mW to 10 mW	0.005		2	95%	No			478f
						Frequency	1.4 GHz to 2 GHz								
RF power: calibration factor on coaxials	Power sensors: 75 Ω, G900, N	Substitution	0.9	1		Power level	1 mW to 10 mW	0.001		2	95%	No			480a
						Frequency	DC to 1 MHz								
RF power: calibration factor on coaxials	Power sensors: 75 Ω, G900, N	Substitution	0.9	1		Power level	1 mW to 10 mW	0.0015		2	95%	No			480b

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
						Frequency	1 MHz to 30 MHz								
RF power: calibration factor on coaxials	Power sensors: 75Ω, G900, N	Substitution	0.9	1		Power level	1 mW to 10 mW	0.002		2	95%	No			480c
						Frequency	30 MHz to 300 MHz								
RF power: calibration factor on coaxials	Power sensors: 75Ω, G900, N	Substitution	0.9	1		Power level	1 mW to 10 mW	0.003		2	95%	No			480d
						Frequency	300 MHz to 600 MHz								
RF power: calibration factor on coaxials	Power sensors: 75Ω, G900, N	Substitution	0.9	1		Power level	1 mW to 10 mW	0.004		2	95%	No			480e
						Frequency	600 MHz to 1 GHz								
RF power: effective efficiency on waveguides	Barretters, thermistors: R100	DC substitution in microcalorimeter	0.9	1		Power level	1 mW to 10 mW	0.0015		2	95%	No			483
						Frequency	8.2 GHz to 12.4 GHz								
RF power: effective efficiency on waveguides	Barretters, thermistors: R140	DC substitution in microcalorimeter	0.9	1		Power level	1 mW to 10 mW	0.002		2	95%	No			484
						Frequency	12.4 GHz to 18 GHz								
RF power: effective efficiency on waveguides	Barretters, thermistors: R220	DC substitution in microcalorimeter	0.9	1		Power level	1 mW to 10 mW	0.003		2	95%	No			485
						Frequency	18 GHz to 26.5 GHz								
RF power: effective efficiency on waveguides	Barretters, thermistors: R320	DC substitution in microcalorimeter	0.9	1		Power level	1 mW to 10 mW	0.003		2	95%	No			486
						Frequency	26.5 GHz to 40 GHz								

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
RF power: effective efficiency on waveguides	Barretters, thermistors: R900	DC substitution in microcalorimeter	0.7	1		Power level	1 mW to 3 mW	0.015		2	95%	No			487
						Frequency	75 GHz to 97 GHz								
RF power: calibration factor on waveguides	Barretters, thermistors: R100	DC substitution in microcalorimeter, reflection measurement	0.9	1		Power level	1 mW to 10 mW	0.002		2	95%	No			488
						Frequency	8.2 GHz to 12.4 GHz								
RF power: calibration factor on waveguides	Barretters, thermistors: R140	DC substitution in microcalorimeter, reflection measurement	0.9	1		Power level	1 mW to 10 mW	0.002		2	95%	No			489
						Frequency	12.4 GHz to 18 GHz								
RF power: calibration factor on waveguides	Barretters, thermistors: R220	DC substitution in microcalorimeter, reflection measurement	0.9	1		Power level	1 mW to 10 mW	0.0033		2	95%	No			490
						Frequency	18 GHz to 26.5 GHz								
RF power: calibration factor on waveguides	Barretters, thermistors: R320	DC substitution in microcalorimeter, reflection measurement	0.9	1		Power level	1 mW to 10 mW	0.006		2	95%	No			491
						Frequency	26.5 GHz to 40 GHz								
Scalar RF attenuation: on coaxials	Passive devices, fixed and variable attenuators: 50Ω, N, PC7, attenuation: A	Power ratio method	1	30	dB	Frequency	0.1 MHz to 8 GHz	0.0001A	dB	2	95%	No			494
						Reflection coefficient of device	< 0.005								

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
Scalar RF attenuation: on coaxials	Passive devices, fixed and variable attenuators: 50Ω, N, PC7, attenuation:A	Power ratio method	1	30	dB	Frequency	8 GHz to 18 GHz	0.0002A	dB	2	95%	No			495
						Reflection coefficient of device	< 0.005								
Scalar RF attenuation: on coaxials	Passive devices, fixed and variable attenuators: 50Ω, N, PC7, attenuation:A	RF substitution	30	90	dB	Frequency	2.5 MHz to 1.2 GHz	0.0002A	dB	2	95%	No			496
						Reflection coefficient of device	< 0.005								
Scalar RF attenuation: on coaxials	Passive devices, fixed and variable attenuators: 50Ω, N, PC7, attenuation:A	RF substitution	90	120	dB	Frequency	2.5 MHz to 1.2 GHz	0.0005A	dB	2	95%	No			496a
						Reflection coefficient of device	< 0.005								
Scalar RF attenuation: on coaxials	Passive devices, fixed and variable attenuators: 50Ω, N, PC7, attenuation:A	RF substitution	30	90	dB	Frequency	1.2 GHz to 18 GHz	0.0005A	dB	2	95%	No			496b
						Reflection coefficient of device	< 0.005								
Scalar RF attenuation: on coaxials	Passive devices, fixed and variable attenuators: 50Ω, N, PC7, attenuation:A	RF substitution	90	100	dB	Frequency	1.2 GHz to 18 GHz	0.001A	dB	2	95%	No			496c
						Reflection coefficient of device	< 0.005								
Scalar RF attenuation: on coaxials	Passive devices, fixed and variable attenuators: 50Ω, PC3.5	Power ratio method	0	30	dB	Frequency	18 GHz to 26.5 GHz	0.006	dB	2	95%	No			497

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
						Reflection coefficient of device	< 0.005								
Scalar RF attenuation: on coaxials	Passive devices, fixed and variable attenuators: 50Ω, K (2.92 mm)	Power ratio method	0	30	dB	Frequency	26.5 GHz to 40 GHz	0.012	dB	2	95%	No			497a
						Reflection coefficient of device	< 0.005								
Scalar RF attenuation: on coaxials	Passive devices, fixed and variable attenuators: 75Ω, N	Power ratio method	0	1	dB	Frequency	0.1 MHz to 2 GHz	0.0002	dB	2	95%	No			498
						Reflection coefficient of device	< 0.005								
Scalar RF attenuation: on coaxials	Passive devices, fixed and variable attenuators: 75Ω, N, attenuation: A	Power ratio method	1	30	dB	Frequency	0.1 MHz to 2 GHz	0.0001A	dB	2	95%	No			499
						Reflection coefficient of device	< 0.005								
Scalar RF attenuation: on coaxials	Passive devices, fixed and variable attenuators: 50Ω, N, PC7	Power ratio method	0	1	dB	Frequency	0.1 MHz to 8 GHz	0.0002	dB	2	95%	No			504
						Reflection coefficient of device	< 0.005								
Scalar RF attenuation: on coaxials	Passive devices, fixed and variable attenuators: 50Ω, N, PC7	Power ratio method	0	1	dB	Frequency	8 GHz to 18 GHz	0.0005	dB	2	95%	No			505
						Reflection coefficient of device	< 0.005								
Scalar RF attenuation: on waveguides	Passive devices, fixed and variable attenuators: R100	Power ratio method	0	1	dB	Frequency	8.2 GHz to 12.4 GHz	0.0001	dB	2	95%	No			506

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
						Reflection coefficient of device	< 0.005								
Scalar RF attenuation: on waveguides	Passive devices, fixed and variable attenuators: R100, attenuation: A	Power ratio method	1	30	dB	Frequency	8.2 GHz to 12.4 GHz	0.0001A	dB	2	95%	No			507
						Reflection coefficient of device	< 0.005								
Scalar RF attenuation: on waveguides	Passive devices, fixed and variable attenuators: R100, attenuation: A	RF substitution	30	60	dB	Frequency	8.2 GHz to 12.4 GHz	0.0002A	dB	2	95%	No			508
						Reflection coefficient of device	< 0.005								
Scalar RF attenuation: on waveguides	Passive devices, fixed and variable attenuators: R140	Power ratio method	0	1	dB	Frequency	12.4 GHz to 18 GHz	0.0001	dB	2	95%	No			509
						Reflection coefficient of device	< 0.005								
Scalar RF attenuation: on waveguides	Passive devices, fixed and variable attenuators: R140, attenuation: A	Power ratio method	1	30	dB	Frequency	12.4 GHz to 18 GHz	0.0001A	dB	2	95%	No			510
						Reflection coefficient of device	< 0.005								
Scalar RF attenuation: on waveguides	Passive devices, fixed and variable attenuators: R140, attenuation: A	RF substitution	30	60	dB	Frequency	12.4 GHz to 18 GHz	0.0005A	dB	2	95%	No			511
						Reflection coefficient of device	< 0.005								

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
Scalar RF attenuation: on waveguides	Passive devices, fixed and variable attenuators: R220	Power ratio method	0	1	dB	Frequency	18 GHz to 26.5 GHz	0.0002	dB	2	95%	No			512
						Reflection coefficient of device	< 0.005								
Scalar RF attenuation: on waveguides	Passive devices, fixed and variable attenuators: R220, attenuation: A	Power ratio method	1	30	dB	Frequency	18 GHz to 26.5 GHz	0.0002A	dB	2	95%	No			513
						Reflection coefficient of device	< 0.005								
Scalar RF attenuation: on waveguides	Passive devices, fixed and variable attenuators: R320	Power ratio method	0	1	dB	Frequency	26.5 GHz to 40 GHz	0.0002	dB	2	95%	No			514
						Reflection coefficient of device	< 0.005								
Scalar RF attenuation: on waveguides	Passive devices, fixed and variable attenuators: R320, attenuation: A	Power ratio method	1	30	dB	Frequency	26.5 GHz to 40 GHz	0.0002A	dB	2	95%	No			515
						Reflection coefficient of device	< 0.005								
Scattering parameters: reflection coefficient (Sii) on coaxials, real and imaginary	Passive one-port devices: 50 Ω, G900	Cross ratio method with network analyzer	0	0.2		Frequency	250 MHz to 8 GHz	0.003		2	95%	No			537
Scattering parameters: reflection coefficient (Sii) on coaxials, real and imaginary	Passive one-port devices: 75 Ω, G900	Cross ratio method with network analyzer	0	0.2		Frequency	250 MHz to 2 GHz	0.003		2	95%	No			538

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
Scattering parameters: reflection coefficient (S_{ii}) on coaxials, real and imaginary	Passive one-port devices: 50Ω , PC7	Cross ratio method with network analyzer	0	0.2		Frequency	500 MHz to 18 GHz	0.003		2	95%	No			539
Scattering parameters: reflection coefficient (S_{ii}) on coaxials, real and imaginary	Passive one-port low-reflective devices: 50Ω , N	Extrapolation (DC resistance measurement and cross ratio method)	near 0			Frequency	DC to 500 MHz	0.005		2	95%	No			539a
Scattering parameters: reflection coefficient (S_{ii}) on coaxials, real and imaginary	Passive one-port devices: 50Ω , N, PC7	Extended cross ratio method with network analyzer	0	0.2		Frequency	45 MHz to 2 GHz	0.003 to 0.005		2	95%	No			539b
Scattering parameters: reflection coefficient (S_{ii}) on coaxials, real and imaginary	Passive one-port devices: 50Ω , N	Cross ratio method with network analyzer	0	0.2		Frequency	500 MHz to 18 GHz	0.003		2	95%	No			539c
Scattering parameters: reflection coefficient (S_{ii}) on coaxials, real and imaginary	Passive one-port devices: 50Ω , PC3.5	Cross ratio method with network analyzer	0	0.2		Frequency	500 MHz to 26.5 GHz	0.003		2	95%	No			540
Scattering parameters: reflection coefficient (S_{ii}) on waveguides, real and imaginary	Passive one-port devices: R100	Cross ratio method with network analyzer	0	0.2		Frequency	8.2 GHz to 12.4 GHz	0.001 to 0.002		2	95%	No			541
Scattering parameters: reflection coefficient (S_{ii}) on waveguides, real and imaginary	Passive one-port devices: R140	Cross ratio method with network analyzer	0	0.2		Frequency	12.4 GHz to 18 GHz	0.001 to 0.002		2	95%	No			542

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
Scattering parameters: reflection coefficient (S_{ii}) on waveguides, real and imaginary	Passive one-port devices: R220	Cross ratio method with network analyzer	0	0.2		Frequency	18 GHz to 26.5 GHz	0.001 to 0.003		2	95%	No			543
Scattering parameters: reflection coefficient (S_{ii}) on waveguides, real and imaginary	Passive one-port devices: R320	Cross ratio method with network analyzer	0	0.2		Frequency	26.5 GHz to 40 GHz	0.001 to 0.003		2	95%	No			544
Scattering parameters: transmission coefficient (S_{ij}) on coaxials, phase	Passive devices, fixed attenuators: 50 Ω , PC7	Network analyzer	-180	180	$^\circ$	Attenuation range	0 dB to 60 dB	0.33 to 1.2	$^\circ$	2	95%	No		Uncertainty depends on frequency	526
						Frequency	45 MHz to 18 GHz								
Scattering parameters: transmission coefficient (S_{ij}) on coaxials, phase	Passive devices, fixed attenuators: 50 Ω , PC3.5	Network analyzer	-180	180	$^\circ$	Attenuation range	0 dB to 60 dB	1.1 to 2.1	$^\circ$	2	95%	No		Uncertainty depends on frequency	527
						Frequency	18 GHz to 26.5 GHz								
Scattering parameters: transmission coefficient (S_{ij}) on coaxials, phase	Passive devices, fixed attenuators: 50 Ω , K (2.92 mm)	Network analyzer	-180	180	$^\circ$	Attenuation range	0 dB to 60 dB	1.6 to 2.8	$^\circ$	2	95%	No		Uncertainty depends on frequency	527a
						Frequency	26.5 GHz to 40 GHz								
RF noise: excess noise ratio in coaxials	Noise source: 50 Ω , PC7	Radiometer	10	20	dB	Frequency	8.2 GHz to 18 GHz	0.05	dB	2	95%	No			546

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
RF noise: excess noise ratio in waveguides	Noise source: R100	Radiometer	10	20	dB	Frequency	8.2 GHz to 12.4 GHz	0.04	dB	2	95%	No			547
RF noise: excess noise ratio in waveguides	Noise source: R140	Radiometer	10	20	dB	Frequency	12.4 GHz to 18 GHz	0.043	dB	2	95%	No			548
Signal and pulse characteristics: pulse amplitude	Pulse generator	Oscilloscope	2	40	V	Rise time	150 ps to 50 µs	25	mV/V	2	95%	Yes			549
Signal and pulse characteristics: pulse time parameters	Pulse generator	Oscilloscope	1.5E-10	5E-05	s	Amplitude	2 V to 40 V	0.028		2	95%	Yes			550
RF voltage: RF-DC transfer difference	RF voltmeters, thermal voltage converters: high impedance, 50 Ω and 75 Ω, G900, N, BNC, G874	Substitution	0.2	10	V	Relative difference	0 to 0.02	0.0003 to 0.005		2	95%	Yes	Matrix 11.1	For connectors other than G874 and N(50 Ω) the uncertainty is increased	551
						Frequency	1 MHz to 100 MHz								
RF voltage: RF-DC transfer difference	RF voltmeters, thermal voltage converters: high impedance, G874	Substitution	10	30	V	Relative difference	0 to 0.02	0.001		2	95%	Yes			569
						Frequency	1 MHz to 5 MHz								
RF voltage: RF-DC transfer difference	RF voltmeters, thermal voltage converters: high impedance, G874	Substitution	10	30	V	Relative difference	0 to 0.02	0.002		2	95%	Yes			569a
						Frequency	5 MHz to 20 MHz								
RF voltage: RF-DC transfer difference	RF voltmeters, thermal voltage converters: high impedance, G874	Substitution	10	30	V	Relative difference	0 to 0.02	0.003		2	95%	Yes			569b
						Frequency	20 MHz to 30 MHz								

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
RF voltage: RF-DC transfer difference	RF voltmeters, thermal voltage converters: high impedance, G874	Substitution	10	30	V	Relative difference	0 to 0.02	0.004		2	95%	Yes			569c
						Frequency	30 MHz to 50 MHz								
RF voltage: RF-DC transfer difference	RF voltmeters, thermal voltage converters: high impedance, G874	Substitution	10	30	V	Relative difference	0 to 0.02	0.007		2	95%	Yes			569d
						Frequency	50 MHz to 80 MHz								
RF voltage: RF-DC transfer difference	RF voltmeters, thermal voltage converters: high impedance, G874	Substitution	10	30	V	Relative difference	0 to 0.02	0.008		2	95%	Yes			569e
						Frequency	80 MHz to 100 MHz								
RF voltage: RF-DC transfer difference	RF voltmeters, thermal voltage converters: high impedance, G874	Substitution	30	100	V	Relative difference	0 to 0.02	0.0015		2	95%	Yes			572a
						Frequency	1 MHz to 5 MHz								
RF voltage: RF-DC transfer difference	RF voltmeters, thermal voltage converters: high impedance, G874	Substitution	30	100	V	Relative difference	0 to 0.02	0.0025		2	95%	Yes			572b
						Frequency	5 MHz to 10 MHz								
RF voltage: RF-DC transfer difference	RF voltmeters, thermal voltage converters: high impedance, G874	Substitution	30	100	V	Relative difference	0 to 0.02	0.003		2	95%	Yes			572c
						Frequency	10 MHz to 20 MHz								
RF voltage: RF-DC transfer difference	RF voltmeters, thermal voltage converters: high impedance, G874	Substitution	30	100	V	Relative difference	0 to 0.02	0.004		2	95%	Yes			572d
						Frequency	20 MHz to 30 MHz								

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
RF voltage: RF-DC transfer difference	RF voltmeters, thermal voltage converters: high impedance, G874	Substitution	30	100	V	Relative difference	0 to 0.02	0.005		2	95%	Yes			572e
						Frequency	30 MHz to 50 MHz								
RF voltage: RF-DC transfer difference	RF voltmeters, thermal voltage converters: high impedance, G874	Substitution	30	100	V	Relative difference	0 to 0.02	0.008		2	95%	Yes			572f
						Frequency	50 MHz to 80 MHz								
RF voltage: RF-DC transfer difference	RF voltmeters, thermal voltage converters: high impedance, G874	Substitution	30	100	V	Relative difference	0 to 0.02	0.009		2	95%	Yes			572g
						Frequency	80 MHz to 100 MHz								
RF voltage: RF-DC transfer difference	RF voltmeters, thermal voltage converters: high impedance, 50 Ω and 75 Ω, G900, N, BNC, G874	Substitution	0.2	1	V	Relative difference	0 to 0.2	0.002		2	95%	Yes		For connectors other than N(50Ω) the uncertainty is increased	572h
						Frequency	100 MHz to 200 MHz								
RF voltage: RF-DC transfer difference	RF voltmeters, thermal voltage converters: high impedance, 50 Ω and 75 Ω, G900, N, BNC, G874	Substitution	0.2	1	V	Relative difference	0 to 0.2	0.003		2	95%	Yes		For connectors other than N(50Ω) the uncertainty is increased	572i
						Frequency	200 MHz to 300 MHz								
RF voltage: RF-DC transfer difference	RF voltmeters, thermal voltage converters: high impedance, 50 Ω and 75 Ω, G900, N, BNC, G874	Substitution	0.2	1	V	Relative difference	0 to 0.2	0.004		2	95%	Yes		For connectors other than N(50Ω) the uncertainty is increased	572j
						Frequency	300 MHz to 400 MHz								

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
RF voltage: RF-DC transfer difference	RF voltmeters, thermal voltage converters: high impedance, 50 Ω and 75 Ω, G900, N, BNC, G874	Substitution	0.2	1	V	Relative difference	0 to 0.2	0.005		2	95%	Yes		For connectors other than N(50Ω) the uncertainty is increased	572k
						Frequency	400 MHz to 1 GHz								
RF voltage: RF-DC transfer difference	RF voltmeters, thermal voltage converters: high impedance, 50 Ω and 75 Ω, G900, N, BNC, G874	Substitution	1	10	V	Relative difference	0 to 0.2	0.003 to 0.007		2	95%	Yes	Matrix 11.2	For connectors other than N(50Ω) the uncertainty is increased	572l
						Frequency	100 MHz to 1 GHz								
RF voltage: RF-DC transfer difference	Micropotentiometer: 50 Ω, N-female	Substitution	0.001	1	V	Relative difference	0 to 0.2	0.0006 to 0.018		2	95%	Yes	Matrix 11.3		573
						Frequency	1 MHz to 1 GHz								
RF characteristic impedance: mechanical cross dimensions	Coaxial air line impedance standards: 50 Ω and 75 Ω: N, 50 Ω: PC7	Air-gauge system						0.004	mm	2	95%	No		Rated values of cross dimensions given by written standards	585a
RF characteristic impedance: mechanical dimensions, length	Coaxial air line impedance standards: 50 Ω and 75 Ω: N, 50 Ω: PC7	Heidenhain probe system	37	300	mm			0.005	mm	2	95%	No			585b
RF characteristic impedance: mechanical cross dimensions	Coaxial air line impedance standards: 50 Ω: PC3.5, PC2.92, PC2.4	Air-gauge system						0.004	mm	2	95%	No		Rated values of cross dimensions given by written standards	585c
RF characteristic impedance: mechanical dimensions, length	Coaxial air line impedance standards: 50 Ω: PC3.5, PC2.92, PC2.4	Heidenhain probe system	37	150	mm			0.005	mm	2	95%	No			585d
Electrical conductivity: metallic materials	Conductivity of metallic bars	Resistance and geometry	5	60	MS/m	Length	> 200 mm	80E-05		2	95%	Yes		Uncertainty depends on geometry of the sample	586

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
						Width	19 mm to 31 mm								
						Height	2.5 mm to 9 mm								
Soft magnetic sheet materials: specific total power loss (alternating field)	Electrical sheet steel, Epstein samples, according to IEC 60404-2	Epstein frame, ring method, wattmetric method	0.1	100	W/kg	Frequency	16 Hz to 400 Hz	1 to 20	1E-03	2	95%	Yes		Measurand range, limit values of parameters, material and uncertainty of measurement interdepend mutually	587
						Peak value of magnetic polarization	0.5 T to 1.9 T								
Soft magnetic sheet materials: specific total power loss (alternating field)	Electrical sheet steel, single sheet samples according to IEC 60404-3	Single sheet tester, wattmetric method	0.1	10	W/kg	Frequency	16 Hz to 100 Hz	5 to 20	1E-03	2	95%	Yes		Measurand range, limit values of parameters, material and uncertainty of measurement interdepend mutually	589
						Peak value of magnetic polarization	0.5 T to 1.8 T								
Soft magnetic sheet materials: peak value of DC magnetic polarization	Electrical sheet steel, Epstein samples, ring samples	Epstein frame, ring method, switching mode method	0.1	2	T	Maximum value of DC magnetic field strength	1 A/m to 30000 A/m	1 to 10	1E-03	2	95%	Yes		Measurand range, limit values of parameters, material and uncertainty of measurement interdepend mutually	590
						Frequency	16 Hz to 400 Hz	1 to 15	1E-03	2	95%	Yes		Measurand range, limit values of parameters, material and uncertainty of measurement interdepend mutually	592
						Peak value of magnetic field strength	5 A/m to 10000 A/m								
Soft magnetic sheet materials: peak value of AC magnetic polarization	Electrical sheet steel, single sheet samples according to IEC 60404-3	Single sheet tester	0.5	1.8	T	Frequency	16 Hz to 100 Hz	1 to 10	1E-03	2	95%	Yes		Measurand range, limit values of parameters, material and uncertainty of measurement interdepend mutually	594
						Peak value of magnetic field strength	10 A/m to 5000 A/m								

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
Soft magnetic sheet materials: peak value of magnetic field strength (alternating field)	Electrical sheet steel, Epstein samples, ring samples, according to IEC 60404-2	Epstein frame, ring method	5	10000	A/m	Frequency	16 Hz to 400 Hz	0.8 to 10	1E-03	2	95%	Yes		Measurand range, limit values of parameters, material and uncertainty of measurement interdepend mutually	595
						Peak value of magnetic polarization	0.5 T to 1.9 T								
Soft magnetic sheet materials: peak value of magnetic field strength (alternating field)	Electrical sheet steel, single sheet samples according to IEC 60404-3	Single sheet tester	10	10000	A/m	Frequency	16 Hz to 100 Hz	1 to 10	1E-03	2	95%	Yes		Measurand range, limit values of parameters, material and uncertainty of measurement interdepend mutually	597
						Peak value of magnetic polarization	0.5 T to 1.8 T								
Soft magnetic sheet materials: RMS value of magnetic field strength (alternating field)	Electrical sheet steel, Epstein samples, ring samples, according to IEC 60404-2	Epstein frame, ring method	5	3000	A/m	Frequency	16 Hz to 400 Hz	0.8 to 10	1E-03	2	95%	Yes		Measurand range, limit values of parameters, material and uncertainty of measurement interdepend mutually	598
						Peak value of magnetic polarization	0.5 T to 1.9 T								
Soft magnetic sheet materials: RMS value of the magnetic field strength	Electrical sheet steel, single sheet samples according to IEC 60404-3	Single sheet tester	5	3000	A/m	Frequency	16 Hz to 400 Hz	1 to 10	1E-03	2	95%	Yes		Measurand range, limit values of parameters, material and uncertainty of measurement interdepend mutually	600
						Peak value of magnetic polarization	0.5 T to 1.8 T								
Soft magnetic sheet materials: specific apparent power	Electrical sheet steel, Epstein samples according to IEC 60404-2, ring samples, single sheet samples according to IEC 60404-3	Epstein frame, ring method, single sheet tester	0.2	350	VA/kg	Frequency	16 Hz to 400 Hz	2 to 50	1E-03	2	95%	Yes		Measurand range, limit values of parameters, material and uncertainty of measurement interdepend mutually	601

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
						Peak value of magnetic polarization	0.5 T to 1.9 T								
Soft magnetic sheet materials: density	Silicon iron electrical sheet steel, Epstein strip and single sheet	IEC 60404-13: two points electrical potential method, van der Pauw method	7610	7895	kg/m ³			5E-03		2	95%	Yes			604
Soft magnetic sheet materials: resistivity	Silicon iron electrical sheet steel, Epstein strip and single sheet	IEC 60404-13: two points electrical potential method, van der Pauw method	12E-08	53E-08	Ωm			2E-03		2	95%	Yes			605
Soft magnetic bulk materials: magnetic polarization (quasi-static field)	Bulk soft magnetic material, rod samples, length > 250 mm, according to IEC 60404-4	Permeameter	0.1	2.1	T	Magnetic field strength	1 kA/m to 200 kA/m	5 to 15	mT/T	2	95%	Yes	Measurand range, limit values of parameters, material and uncertainty of measurement interdepend mutually		606
Soft magnetic bulk materials: magnetic field strength (quasi-static field)	Bulk soft magnetic material, rod samples, length > 250 mm, according to IEC 60404-4	Permeameter	1000	200000	A/m	Magnetic flux density	0.1 T to 2.1 T	5 to 15	1E-03	2	95%	Yes	Measurand range, limit values of parameters, material and uncertainty of measurement interdepend mutually		607
Soft magnetic bulk materials: remanent flux density (quasi-static field)	Bulk soft magnetic material, rod samples, length > 250 mm, according to IEC 60404-4	Permeameter	0.5	1.5	T	Maximum magnetic polarization	2.1 T	10	mT/T	2	95%	Yes	Measurand range, limit values of parameters, material and uncertainty of measurement interdepend mutually		608
						Maximum field strength	200 kA/m								

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
Soft magnetic bulk materials: coercive field strength (quasi-static field)	Bulk soft magnetic material, rod samples, length > 250 mm, according to IEC 60404-4	Permeameter	1000	20000	A/m	Maximum magnetic polarization	2.1 T	10E-03		2	95%	Yes		The uncertainty depends on the material and sample size and shape	609
						Maximum field strength	200 kA/m								
Soft magnetic bulk materials: coercive field strength (static field)	Rod samples	Open circuit with fluxgate magnetometers	0.2	1000	A/m	Maximum field strength	100 kA/m	1 to 10	1E-03	2	95%	Yes		The uncertainty depends on material and sample size and shape	610
Soft magnetic bulk materials: magnetic saturation polarization (quasi-static field)	Bulk soft magnetic material, cylinders 5 mm to 10 mm long	Electromagnet	0.1	1.2	T	Maximum magnetic field strength	2300 kA/m	3 to 10	mT/T	2	95%	Yes		The uncertainty depends on material and sample size and shape	611
Feebly magnetic, paramagnetic and diamagnetic material: DC magnetic susceptibility	Feebly magnetic material, rod samples	Solenoid pull out method	1E-04	1		Magnetic field strength	10 kA/m to 30 kA/m	2 to 10	1E-03	2	95%	Yes		The uncertainty depends on material and sample size and shape	612
Feebly magnetic, paramagnetic and diamagnetic material: DC magnetic susceptibility	Feebly magnetic material, paramagnetic material, diamagnetic material, long rods, powders, liquids	Gouy balance	1E-06	1E-04		Magnetic field strength	100 kA/m to 1200 kA/m	1 to 5	1E-03	2	95%	Yes		The uncertainty depends on material and sample size and shape	613
Hard magnetic material: remanent magnetic flux density	Permanent magnetic material, cylinders or parallelepipeds, according to IEC 60404-5	Electromagnet	0.1	2	T			1 to 5	mT/T	2	95%	Yes		The uncertainty range depends on the material and the sample size and shape	614

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
Hard magnetic material: coercive field strength H_{CB}	Permanent magnetic material, cylinders or parallelepipeds	Electromagnet	1	1000	kA/m			3 to 10	1E-03	2	95%	Yes		The uncertainty range depends on the material and the sample size and shape	615
Hard magnetic material: coercive field strength H_{CJ}	Permanent magnetic material, cylinders or parallelepipeds	Electromagnet	1000	2300	kA/m			3 to 10	1E-03	2	95%	Yes		The uncertainty range depends on the material and sample size and shape	616
Hard magnetic material: maximum energy product (BH) _{max}	Permanent magnetic material, cylinders or parallelepipeds, according to IEC 60404-5	Electromagnet	5	500	kJ/m ³			5 to 20	1E-03	2	95%	Yes		The uncertainty range depends on the material and the sample size and shape	617
Hard magnetic material: magnetic moment	Permanent magnetic material, unidirectional magnetized	Magnetic moment sensing coil and fluxmeter	0.01	1000	Am ²			3 to 10	1E-03	2	95%	Yes		The uncertainty range depends on the material and the sample size and shape	618
Magnetic data storage media: signal amplitude of magnetic stripes	Magnetic stripes on id-cards, thin flexible cards and saving books (ISO/IEC 7811 2, -6, EN753, DIN 32744)	Magnetic stripe tester according to ISO/IEC 10373-2	0.50	1.40		Temperature	21 °C to 25 °C	0.04		2	95%	No		Reference material for electromagnetic properties of data storage media	630
						Relative humidity	0.40 to 0.60								
Magnetic data storage media: signal amplitude of magnetic stripes	Magnetic stripes on id-cards, thin flexible cards and saving books (ISO/IEC 7811 2, -6, EN753, DIN 32744)	Magnetic stripe tester according to ISO/IEC 10373-2	0.01	0.20		Temperature	21 °C to 25 °C	0.10		2	95%	No		Reference material for electromagnetic properties of data storage media	631
						Relative humidity	0.40 to 0.60								
Magnetic data storage media: reference field of diskettes	Diskettes according to ISO/IEC 9529	Diskette tester according to ISO/IEC 9529	0.60	1.5		Temperature	21 °C to 25 °C	0.1		2	95%	No		Reference material for electromagnetic properties of data storage media	633

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)



Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty							
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
Magnetic data storage media: signal amplitude of diskettes, outer diameter	Diskettes according to ISO/IEC 9529	Diskette tester according to ISO/IEC 9529	0.60	1.5		Relative humidity	0.40 to 0.60			2	95%	No		Reference material for electromagnetic properties of data storage media	635
Magnetic data storage media: signal amplitude of diskettes, inner diameter	Diskettes according to ISO/IEC 9529	Diskette tester according to ISO/IEC 9529	0.60	1.5		Temperature	21 °C to 25 °C	0.1		2	95%	No		Reference material for electromagnetic properties of data storage media	636
Magnetic data storage media: resolution of diskettes	Diskettes according to ISO/IEC 9529	Diskette tester according to ISO/IEC 9529	0.60	1		Relative humidity	0.40 to 0.60			2	95%	No		Reference material for electromagnetic properties of data storage media	639
Magnetic data storage media: peak shift of diskettes	Diskettes according to ISO/IEC 9529	Diskette tester according to ISO/IEC 9529	0.20	1.6		Temperature	21 °C to 25 °C	0.16		2	95%	No		Reference material for electromagnetic properties of data storage media	641
Magnetic data storage media: overwrite of diskettes	Diskettes according to ISO/IEC 9529	Diskette tester according to ISO/IEC 9529	0.50	1.7		Relative humidity	0.40 to 0.60			2	95%	No		Reference material for electromagnetic properties of data storage media	643
Magnetic data storage media: overwrite of stripes	High density magnetic stripes on id-cards (ISO/IEC 7811-7)	Magnetic stripe tester according to ISO/IEC 10373-2	0.01	0.20		Temperature	21 °C to 25 °C	0.005		2	95%	No		Reference material for electromagnetic properties of data storage media. Test of overwrite capability of magnetic stripes.	631a

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Uncertainty table: Matrix 4.1

Capacitance: low loss capacitors, PTB Internal Identifier: 50

	1000 Hz	1233 Hz	1592 Hz
1 pF	0.17	0.17	0.17
10 pF	0.12	0.12	0.12
100 pF	0.12	0.12	0.12
1 nF	0.15	0.15	0.15

The expanded uncertainties given in this table are expressed in $\mu\text{F/F}$

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Uncertainty table: Matrix 4.2

Capacitance: low loss capacitors, PTB Internal Identifier: 54

	100 Hz	400 Hz	1000 Hz	1600 Hz	4000 Hz	10 kHz	16 kHz
1 pF	30	14	10	12	16	30	60
10 pF	30	14	10	12	16	30	60
100 pF	30	14	10	12	16	30	60
1 nF	30	14	10	12	16	30	60

The expanded uncertainties given in this table are expressed in $\mu\text{F/F}$

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Uncertainty table: Matrix 4.3

Capacitance: low loss capacitors, PTB Internal Identifier: 55

	10 kHz	20 kHz	40 kHz	100 kHz	200 kHz	400 kHz	1 MHz
10 pF	60	60	60	60	60	60	70
100 pF	30	30	30	30	30	40	80
1 nF	50	50	50	50	60	150	700

The expanded uncertainties given in this table are expressed in $\mu\text{F}/\text{F}$

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)**Uncertainty table: Matrix 4.4**

Capacitance: dielectric capacitors, PTB Internal Identifier: 64

	50 Hz	100 Hz	200 Hz	400 Hz	1 kHz	10 kHz
1 nF	50	50	50	50	50	50
10 nF	30	30	30	30	30	50
100 nF	50	50	50	50	50	70
1 µF	50	50	50	50	50	100
10 µF	100	100	100	100	100	200
100 µF	100	100	100	100	100	-
1 mF	200	200	-	-	-	-
10 mF	500	500	-	-	-	-

The expanded uncertainties given in this table are expressed in µF/F

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)
Uncertainty table: Matrix 4.5

Inductance: self inductance, low values, PTB Internal Identifier: 80

Inductance: self inductance, intermediate values, PTB Internal Identifier: 94

Inductance: self inductance, high values, PTB Internal Identifiers: 106 and 113

	50 Hz	60 Hz	100 Hz	200 Hz	400 Hz	1 kHz	2 kHz	4 kHz	10 kHz	20 kHz	40 kHz	100 kHz	200 kHz	400 kHz	1 MHz
1 µH	-	-	-	-	-	1200	1200	1200	1200	1200	1200	1200	1200	1200	2000
2 µH	-	-	-	-	-	1000	1000	1000	1000	1000	1000	1000	1000	1000	2000
5 µH	-	-	-	-	-	1000	1000	1000	1000	1000	1000	1000	1000	1000	2000
10 µH	-	-	-	-	200	250	200	200	250	200	200	300	500	1000	4000
20 µH	-	-	-	-	-	300	300	300	300	300	300	300	500	-	-
50 µH	-	-	100	100	100	100	120	120	120	150	150	300	600	2000	-
100 µH	-	-	100	90	90	80	120	120	120	150	150	300	-	-	-
200 µH	-	-	150	100	100	100	100	100	150	200	300	900	-	-	-
500 µH	-	-	90	80	70	60	70	80	100	150	150	400	-	-	-
1 mH	-	-	70	60	60	50	60	60	60	80	150	450	-	-	-
2 mH	-	-	80	70	60	50	60	70	100	200	200	-	-	-	-
5 mH	-	-	80	70	60	60	70	70	100	250	400	-	-	-	-
10 mH	-	-	70	60	60	40	60	60	70	100	250	-	-	-	-
20 mH	-	-	70	60	50	40	60	60	120	400	-	-	-	-	-
50 mH	-	-	70	60	50	40	60	70	120	-	-	-	-	-	-
100 mH	-	-	70	60	60	40	60	70	150	-	-	-	-	-	-
200 mH	-	-	70	60	50	40	50	80	-	-	-	-	-	-	-
500 mH	80	80	70	60	60	50	60	150	-	-	-	-	-	-	-
1 H	80	80	70	60	60	50	80	-	-	-	-	-	-	-	-
2 H	100	100	80	60	50	50	150	-	-	-	-	-	-	-	-
5 H	100	100	80	60	60	70	-	-	-	-	-	-	-	-	-
10 H	90	90	70	60	70	150	-	-	-	-	-	-	-	-	-
100 H	150	150	100	200	500	-	-	-	-	-	-	-	-	-	-

The expanded uncertainties given in this table are expressed in µH/H

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)
Uncertainty table: Matrix 5.1

AC voltage: AC-DC transfer difference at low voltages, PTB Internal Identifier: 117a

AC voltage: AC-DC transfer difference at medium voltages, PTB Internal Identifier: 124a

AC voltage: AC-DC transfer difference at higher voltages, PTB Internal Identifier: 144a

	10 Hz	20 Hz	30 Hz to 300 Hz	400 Hz to 10 kHz	20 kHz to 30 kHz	50 kHz	70 kHz	100 kHz	200 kHz to 300 kHz	500 kHz	700 kHz to 800 kHz	1 MHz
2 mV	230	180	175	175	180	180	180	200	230	240	250	270
6 mV	150	125	120	120	120	120	120	135	140	150	180	210
10 mV	115	95	85	85	80	85	85	85	95	100	125	160
20 mV	90	75	65	60	60	60	60	65	75	80	110	130
60 mV	65	45	35	45	45	45	45	50	55	60	80	100
100 mV / 200 mV	10	10	10	5	5	5	6	10	15	30	40	60
300 mV / 500 mV	10	10	10	3	4	4	5	6	10	30	35	50
600 mV / 700 mV	10	10	10	3	4	4	5	6	10	30	35	50
1 V / 2 V	2	2	1	1	1	1	2	2	4	11	15	25
3 V / 4 V	2	2	1	1	1	1	2	2	4	11	15	25
5 V / 6 V	2	2	1	1	1	1	2	2	4	11	15	25
7 V	2	2	1	1	1	1	2	2	4	11	15	25
10 V	2	2	2	2	2	3	4	6	8	15	20	30
20 V	5	5	5	5	5	5	6	10	10	20	25	35
30 V	5	5	5	5	5	5	6	10	10	20	25	40
40 V / 50 V	5	5	5	5	5	5	6	10	-	-	-	-
60 V / 70 V	5	5	5	5	5	5	6	10	-	-	-	-
100 V / 200 V	10	10	10	10	10	10	15	25	-	-	-	-
300 V / 500 V	10	10	10	10	10	10	15	25	-	-	-	-
600 V to 1000 V	10	10	10	10	10	10	20	30	-	-	-	-

The expanded uncertainties given in this table are expressed in $\mu\text{V/V}$

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)**Uncertainty table: Matrix 5.2**

AC voltage up to 1000 V: meters, PTB Internal Identifier: 260a

	10 Hz	20 Hz	30 Hz to 300 Hz	400 Hz to 10 kHz	20 kHz to 30 kHz	50 kHz	70 kHz	100 kHz	200 kHz to 300 kHz	500 kHz	700 kHz to 800 kHz	1 MHz
100 mV / 200 mV	30	30	30	30	30	30	30	35	50	200	250	300
300 mV / 500 mV	15	15	12	12	12	12	12	12	40	150	250	300
600 mV / 700 mV	15	15	12	12	12	12	12	12	40	150	250	300
1 V / 2 V	15	15	12	12	12	12	12	12	40	150	250	300
3 V / 4 V / 5 V	12	10	10	10	10	10	10	10	25	150	200	300
6 V / 7 V	12	10	10	10	10	10	10	10	25	150	200	300
10 V / 20 V / 30 V	12	10	10	10	10	10	10	12	25	120	160	300
50 V / 100 V / 200 V	25	25	25	25	25	25	30	35	-	-	-	-
300 V / 400 V	25	25	25	25	25	25	30	35	-	-	-	-
500 V / 600 V	30	30	30	30	30	30	35	40	-	-	-	-
600 V to 1000 V	35	35	35	35	35	35	40	45	-	-	-	-

The expanded uncertainties given in this table are expressed in $\mu\text{V/V}$

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)
Uncertainty table: Matrix 6.1

AC current: AC-DC transfer difference, PTB Internal Identifier: 316a

	10 Hz	20 Hz	30 Hz	400 Hz	500 Hz	1 kHz	5 kHz	10 kHz	20 kHz	50 kHz	70 kHz	100 kHz
3 mA	5	5	5	5	5	5	5	5	5	10	20	25
5 mA	5	5	5	5	5	5	5	5	5	10	15	20
10 mA / 20 mA	5	5	5	5	5	5	5	5	5	5	8	10
30 mA / 50 mA	3	3	3	3	3	3	3	3	3	3	3	3
100 mA / 200 mA	5	5	5	5	5	5	5	5	5	5	8	10
300 mA / 500 mA	10	10	10	10	10	10	10	10	10	10	15	20
1 A	10	10	10	10	10	10	10	10	15	15	20	30
2 A	10	10	10	10	10	10	10	10	20	25	30	40
3 A / 5A	20	20	20	20	20	20	20	20	30	35	50	60
10 A	25	25	25	25	25	25	25	25	35	50	65	80
20 A	30	30	30	30	30	30	40	40	50	60	80	100

The expanded uncertainties given in this table are expressed in $\mu\text{A}/\text{A}$

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Uncertainty table: Matrix 8.1

High DC voltage: high voltage sources, PTB Internal Identifier: 394a

	> 0.1 mA	> 0.2 mA	> 0.5 mA
1 kV to 100 kV	2E-06	2E-06	2E-06
-1 kV to -100 kV	2E-06	2E-06	2E-06
101 kV to 300 kV	-	-	1E-05
-101 kV to -300 kV	-	-	1E-05
301 kV to 400 kV	-	1E-04	1E-04
-301 kV to -400 kV	-	1E-04	1E-04

The expanded uncertainties given in this table are dimensionless

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Uncertainty table: Matrix 8.2

High DC voltage: high voltage meters, PTB Internal Identifier: 395

	< 1 mA	1.1 mA to 6 mA	6.1 mA to 10 mA
1 kV to 100 kV	2E-06	2E-06	2E-06
101 kV to 300 kV	1E-05	1E-05	1E-05
-1 kV to -20 kV	2E-06	2E-06	-
-21 kV to -100 kV	2E-06	-	-

The expanded uncertainties given in this table are dimensionless

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Uncertainty table: Matrix 8.3

High DC voltage: ratios, PTB Internal Identifier: 395a

	< 1 mA	1.1 mA to 6 mA	6.1 mA to 10 mA
1 kV to 100 kV	2E-06	2E-06	2E-06
101 kV to 300 kV	1E-05	1E-05	1E-05
-1 kV to -20 kV	2E-06	2E-06	-
-21 kV to -100 kV	2E-06	-	-

First column reports the voltage parameter

The expanded uncertainties given in this table are dimensionless

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Uncertainty table: Matrix 8.4

High voltage impedance: capacitance, PTB Internal Identifier: 396

	1 kV to 24 kV	25 kV to 200 kV	201 kV to 800 kV
10 pF to 40 pF	-	1E-04	1E-04
41 pF to 200 pF	-	1E-05	1E-05
201 pF to 500 pF	1E-04	1E-04	1E-05
501 pF to 1000 pF	1E-05	1E-04	1E-04

The expanded uncertainties given in this table are dimensionless

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)**Uncertainty table: Matrix 8.5**

High voltage impedance: capacitance dissipation factor, PTB Internal Identifier: 397

	10 pF to 20 pF	21 pF to 200 pF	201 pF to 300 pF	301 pF to 700 pF	701 pF to 1000 pF
< 1E-05	3E-05	1E-05	1E-05	2E-05	1E-05
1E-05 to 1E-04	3E-05	1E-05	2E-05	2E-05	1E-05
1.1E-04 to 1E-03	3E-05	2E-05	3E-05	3E-05	3E-05

The expanded uncertainties given in this table are dimensionless

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)**Uncertainty table: Matrix 8.6**

High voltage impedance: burden: modulus, PTB Internal Identifier: 398

	0.025 A to 0.1 A	0.1 A to 0.5 A	0.5 A to 2 A	2 A to 10 A
0.04 V to 0.2 V	-	-	-	1.E-02
0.2 V to 1 V	-	-	1.E-03	1.E-02
1 V to 5 V	-	1.E-03	1.E-03	1.E-03
5 V to 160 V	1.E-02	1.E-03	1.E-03	1.E-03
160 V to 320 V	1.E-02	1.E-03	1.E-03	-

First column reports the voltage parameter

The expanded uncertainties given in this table are dimensionless

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)
Uncertainty table: Matrix 8.7

High voltage impedance: burden: argument, PTB Internal Identifier: 399

	0.025 A to 0.1A	0.1 A to 0.5 A	0.5 A to 2 A	2 A to 10 A
0.04 V to 0.2 V	-	-	-	10
0.2 V to 1 V	-	-	1	10
1 V to 5 V	-	1	1	1
5 V to 160 V	10	1	1	1
160 V to 320 V	10	1	1	-

First column reports the voltage parameter

The expanded uncertainties given in this table are expressed in mrad

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Uncertainty table: Matrix 8.8

AC high voltage: sources, PTB Internal Identifier: 400

	15 Hz to 65 Hz	66 Hz to 100 Hz	101 Hz to 300 Hz	301 Hz to 400 Hz
1 kV to 200 kV	5E-05	1E-04	2E-04	1E-04
201 kV to 500 kV	1E-04	1E-04	5E-04	-
501 kV to 800 kV	1E-04	-	-	-

The expanded uncertainties given in this table are dimensionless

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Uncertainty table: Matrix 8.9

AC high voltage: meters, PTB Internal Identifier: 401

	15 Hz to 65 Hz	66 Hz to 100 Hz	101 Hz to 300 Hz	301 Hz to 400 Hz
1 kV to 200 kV	5E-05	1E-04	2E-04	1E-04
201 kV to 500 kV	1E-04	1E-04	5E-04	-
501 kV to 800 kV	1E-04	-	-	-

The expanded uncertainties given in this table are dimensionless

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Uncertainty table: Matrix 8.10

AC high voltage: peak values, PTB Internal Identifier: 402

	15 Hz to 65 Hz	66 Hz to 400 Hz
1 kV to 200 kV	5E-05	1E-04
201 kV to 800 kV	1E-04	1E-04

The expanded uncertainties given in this table are dimensionless

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Uncertainty table: Matrix 8.11

AC high voltage: ratio error, PTB Internal Identifier: 404

	16.7 Hz	50 Hz	60 Hz
100 V to 1000 V	-	5E-06	5E-06
1 V to 300 kV	-	2E-06	2E-06
0.2 V to 66 kV	1E-04	-	-

The expanded uncertainties given in this table are dimensionless

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Uncertainty table: Matrix 8.12

AC high voltage: ratio: phase displacement, PTB Internal Identifier: 407

	16.7 Hz	50 Hz	60 Hz
100 V to 1000 V	-	5	5
1 V to 300 kV	-	30	30
0.2 V to 66 kV	100	-	-

The expanded uncertainties given in this table are expressed in μrad

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Uncertainty table: Matrix 8.13

High AC current: ratio error, PTB Internal Identifier: 426

	16.7 Hz	50 Hz	60 Hz
0.05 A to 5 A	-	1E-05	1E-05
5 A to 1000 A	-	5E-06	5E-06
1000 A to 100000 A	-	1E-05	1E-05
5 A to 5000 A	3E-05	-	-

The expanded uncertainties given in this table are dimensionless

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Uncertainty table: Matrix 8.14

High AC current: ratio: phase displacement, PTB Internal Identifier: 430

	16.7 Hz	50 Hz	60 Hz
0.05 A to 5 A	-	10	10
5 A to 1000 A	-	5	5
1000 A to 100000 A	-	15	15
5 A to 5000 A	50	-	-

The expanded uncertainties given in this table are expressed in μrad

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)**Uncertainty table: Matrix 11.1**

RF voltage: RF-DC transfer difference, PTB Internal Identifier: 551

	1 MHz to 5 MHz	5 MHz to 10 MHz	10 MHz to 20 MHz	20 MHz to 30 MHz	30 MHz to 50 MHz	50 MHz to 100 MHz
0.2 V to 1 V	0.0003	0.0005	0.0008	0.001	0.0015	0.002
1 V to 5 V	0.0004	0.001	0.0015	0.002	0.003	0.004
5 V to 10 V	0.0008	0.001	0.0015	0.002	0.003	0.005

The expanded uncertainties given in this table are dimensionless

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)

Uncertainty table: Matrix 11.2

RF voltage: RF-DC transfer difference, PTB Internal Identifier: 572I

	100 MHz to 200 MHz	200 MHz to 300 MHz	300 MHz to 500 MHz	500 MHz to 1 GHz
1 V to 3 V	0.003	0.004	0.005	0.006
3 V to 10 V	0.004	0.005	0.006	0.007

The expanded uncertainties given in this table are dimensionless

Electricity and Magnetism, Germany, PTB (Physikalisch-Technische Bundesanstalt)**Uncertainty table: Matrix 11.3**

RF voltage: RF-DC transfer difference, PTB Internal Identifier: 573

	1 MHz to 10 MHz	10 MHz to 30 MHz	30 MHz to 100 MHz	100 MHz to 500 MHz	500 MHz to 1 GHz
1 mV to 30 mV	0.003	0.005	0.008	0.016	0.018
30 mV to 200 mV	0.0015	0.003	0.006	0.011	0.015
200 mV to 1 V	0.0006	0.002	0.005	0.008	0.011

The expanded uncertainties given in this table are dimensionless